United States Department of Agriculture

Natural Resources Conservation Service

Iowa Department of Agriculture and Land Stewardship

IOWA STATE UNIVERSITY
Iowa Agriculture and Home Economics Experiment Station

IOWA STATE UNIVERSITY
University Extension

In cooperation with Iowa Agriculture and Home Economics Experiment Station and Cooperative Extension Service, Iowa State University, and Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship

Soil Survey of Bremer County, Iowa

Part I

How To Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, the survey area is divided into groups of soils called associations. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the soil associations on the color-coded map legend, and then refer to the section **General Soil Map Units** in Part I for a general description of the soils in your area.

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets** in Part III. Note the number of the map sheet, and turn to that sheet. Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. The **Contents** in Part I lists the map units and shows the page where each map unit is described.

The **Contents** in Part II shows which table has information on a specific land use or soil property for each detailed soil map unit. Also, see the **Contents** in Part I and Part II for other sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 2007. Soil names and descriptions were approved in 2008. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2008. The most current official data are available through the NRCS Web Soil Survey (http://soils.usda.gov).

This survey was made cooperatively by the Natural Resources Conservation Service; the Iowa Agriculture and Home Economics Experiment Station and Cooperative Extension Service, Iowa State University; the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship; and the Bremer County Board of Supervisors. The survey is part of the technical assistance furnished to the Bremer County Soil and Water Conservation District.

Cover: Corn grows well in long, gently sloping areas of Readlyn loam, 1 to 3 percent slopes.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at http://www.nrcs.usda.gov.

Contents

Issued 2009

Foreword

Soil surveys contain information that affects land use planning in survey areas. They include predictions of soil behavior for selected land uses. The surveys highlight soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

Soil surveys are designed for many different users. Farmers, foresters, and agronomists can use the surveys to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the surveys to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the surveys to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each map unit is shown on the detailed soil maps. Each soil in the survey area is described, and information on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

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State Conservationist
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Soil Survey of
Bremer County, Iowa

By Leland D. Camp, Natural Resources Conservation Service

Fieldwork by Leland D. Camp, Kevin K. Norwood, Elizabeth C. Swanberg, Neil R. Sass, and Robert J. Vobora, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with the Iowa Agriculture and Home Economics Experiment Station and the Iowa Cooperative Extension Service, Iowa State University, and the Division of Soil Conservation, Department of Agriculture and Land Stewardship

Bremer County is in northeastern Iowa (fig. 1). It has an area of 281,100 acres, or about 439 square miles. It is bounded on the west by Butler County, on the north by Chickasaw County, on the east by Fayette County, and on the south by Black Hawk County. Waverly is the county seat.

This survey updates the survey of Bremer County published in 1967 (Buckner, 1967). It provides additional information and has larger maps, which show the soils in greater detail.

How This Survey Was Made

This survey was made to provide updated information about the soils and miscellaneous areas in the survey area, which is in Major Land Resource Area 104. Major land resource areas (MLRAs) are geographically associated land resource units that share a common land use, elevation, topography, climate, water, soils, and vegetation (USDA/NRCS, 2006). Bremer County is a subset of MLRA 104, Eastern Iowa and Minnesota Till Prairies.

The information in this survey includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous

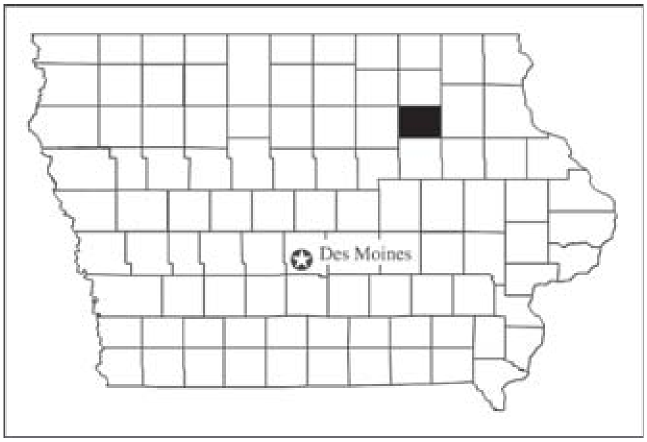

Figure 1.—Location of Bremer County in Iowa.

areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Nature of the Survey Area

This section provides general information about the survey area. It describes history; industry and transportation; agriculture; recreation; physiography, drainage, and geology; and climate.

History

Bremer County was established in 1850. The first settler of European descent came to the area in 1845. At that time, about 300 Native Americans of the Winnebago Tribe lived on a reservation in the area. The reservation was later purchased by the government, and the tribe was moved to the Crow River area of Minnesota, north of St. Paul.

In 1850, Governor Hempstead named the county after the Swedish author Frederika Bremer. Waverly was first settled in 1850 and grew rapidly because of its access to water power for the flour and saw mills, its commercial position, and its railroad facilities. It was chosen as the county seat on January 24, 1853.

Historically, Bremer County has been a mostly rural county. Today, the county's population is roughly 50 percent urban and 50 percent rural, according to data gathered in the 2000 U.S. census. Waverly is the largest city in Bremer County. Its population was about 9,000 in 2000.

Industry and Transportation

Bremer County has a few major industries, most of which are located in Waverly. These include manufacturing, insurance, and service-oriented businesses. Many businesses in Bremer County are small, locally owned specialty stores.

The major highways in Bremer County are U.S. Highway 218, which runs north-south in the western part of the county, and U.S. Highway 63, which runs north-south through the central part of the county. Three main highways, State Highways 3, 93, and 188, run east-west across the county. These highways, along with several hard-surface and gravel county roads, connect U.S. Highways 218 and 63 with all parts of the county. All farms have access to hard-surfaced roads. There is a small municipal airport just northwest of Waverly. One rail line provides railroad service to communities in Bremer County. Motor freight lines serve every trading center in the county.

Agriculture

Bremer County is primarily an agricultural county. According to the 2002 Census of Agriculture, about 254,923 acres, or about 90 percent of the total acreage, consists of farms. About 90 percent of the farmland is cropland, and the remaining 10 percent is

used for livestock or other purposes. In 2002, the number of farms was 956 and the average farm size was 267 acres.

Recreation

Bremer County is home to several state parks and county parks, including Sweet's Marsh east of Tripoli and Cedar Bend Park northwest of Waverly. Most of the towns in the county have at least one city park providing community recreation. The Waverly Bike Trail follows an old railroad track and connects the towns of Waverly and Denver. The Cedar, Shell Rock, and Wapsipinicon Rivers provide opportunities for canoeing, fishing, and hunting. The upland areas also offer a variety of hunting opportunities.

Physiography, Drainage, and Geology

The topography in most of the county is characterized by long, gentle slopes with open views; slightly rounded ridges; and broad, nearly level valleys with unclear valley edges and well established low-gradient drainageways. The Cedar River, the Wapsipinicon River, and the Shell Rock River are the major drainage systems in the county. Erosion on a large scale is the key to the geological origins of the area. The landscape was last glaciated in Pre-Illinoian time (more than 150,000 years ago) and since has lain exposed to various episodes of weathering and erosion. Extensive freeze-thaw action, massive dislodgment of loosened material, sheetwash of slopes, and violent winds were forms of erosional scouring that took place throughout the cold but ice-free tundra-covered areas some 15,000 to 20,000 years ago. The climatic conditions during this time wore down the landscape. The Pre-Illinoian upland summits and divides were lowered, and only a small portion of the former landscape remains in the form of a paleosol (Prior, 1991).

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Tripoli in the period from 1971 to 2000. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season.

In winter, the average temperature is 18.7 degrees F and the average daily minimum temperature is 10.0 degrees. The lowest temperature during the period of record is -32 degrees. In summer, the average temperature is 70.2 degrees and the average daily maximum temperature is 81.4 degrees. The highest temperature during the period of record is 104 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 36 inches. Of this total, 25.94 inches, or about 72 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 13.8 inches.

The average seasonal snowfall is 36.5 inches. On the average, 45 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

Table 1.--Temperature and Precipitation

(Recorded in the period 1971-2000 at Tripoli, Iowa)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	23.7	5.5	14.6	49	-25	0	1.02	0.54	1.47	3	9.2
February---	29.8	12.2	21.0	55	-22	6	.93	.22	1.66	3	6.7
March------	43.4	24.7	34.0	76	-4	63	2.13	.97	3.24	5	5.0
April------	58.3	36.1	47.2	85	13	256	3.65	2.13	5.01	7	2.4
May--------	71.1	47.9	59.5	90	30	605	4.28	2.55	5.80	8	.0
June-------	80.1	57.3	68.7	96	41	861	5.02	3.03	6.78	7	.0
July-------	83.2	61.3	72.2	97	47	1,000	4.47	2.42	6.44	7	.0
August-----	80.9	58.7	69.8	95	43	921	5.34	2.13	8.19	7	.0
September--	73.6	49.9	61.8	92	31	653	3.18	1.55	4.71	5	.0
October----	61.1	38.3	49.7	85	19	318	2.56	1.13	4.00	5	.1
November---	42.8	25.5	34.2	69	-1	58	2.40	1.00	3.80	5	4.5
December---	28.9	12.3	20.6	54	-19	3	1.16	.51	1.72	3	8.6
Yearly:											
Average---	56.4	35.8	46.1	---	---	---	---	---	---	---	---
Extreme---	104	-32	---	99	-27	---	---	---	---	---	---
Total-----	---	---	---	---	---	4,744	36.14	26.64	42.32	65	36.5

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Tripoli, Iowa)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 16	Apr. 30	May 15
2 years in 10 later than--	Apr. 13	Apr. 25	May 10
5 years in 10 later than--	Apr. 5	Apr. 16	May 1
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 15	Sept. 30	Sept. 22
2 years in 10 earlier than--	Oct. 20	Oct. 5	Sept. 27
5 years in 10 earlier than--	Oct. 30	Oct. 15	Oct. 5

Table 3.--Growing Season

(Recorded in the period 1971-2000 at Tripoli, Iowa)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	185	162	141
8 years in 10	191	169	147
5 years in 10	203	183	158
2 years in 10	214	196	169
1 year in 10	220	203	175

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. These broad areas are called associations. Each association on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

1. Floyd-Clyde-Kenyon Association (fig. 2)

Extent of the association in the survey area: 40 percent

Component Description

Floyd
Extent: 25 to 45 percent of the unit
Position on the landscape: Concave footslopes adjacent to upland drainageways
Slope range: 1 to 4 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 10.7 inches
Content of organic matter in the upper 10 inches: 5.2 percent

Clyde
Extent: 20 to 40 percent of the unit
Position on the landscape: Drainageways
Slope range: 0 to 3 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)

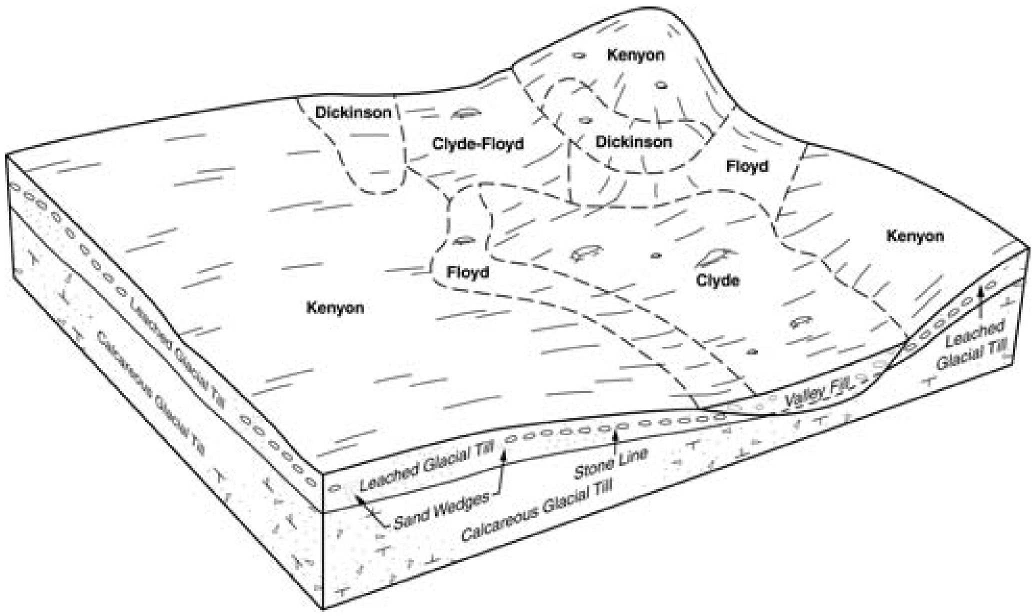

Figure 2.—Typical pattern of soils and parent material in the Floyd-Clyde-Kenyon association.

Drainage class: Poorly drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 7.0 percent

Kenyon
Extent: 20 to 40 percent of the unit
Position on the landscape: Summits, shoulders, and side slopes
Slope range: 2 to 9 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Soils of Minor Extent

Dickinson and similar soils
Extent: 0 to 15 percent of the association

2. Tripoli-Readlyn Association (fig. 3)

Extent of the association in the survey area: 23 percent

Component Description

Tripoli
Extent: 40 to 60 percent of the association
Position on the landscape: Upland flats
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.1 inches
Content of organic matter in the upper 10 inches: 6.2 percent

Readlyn
Extent: 30 to 50 percent of the association
Position on the landscape: Slightly convex side slopes
Slope range: 1 to 3 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)

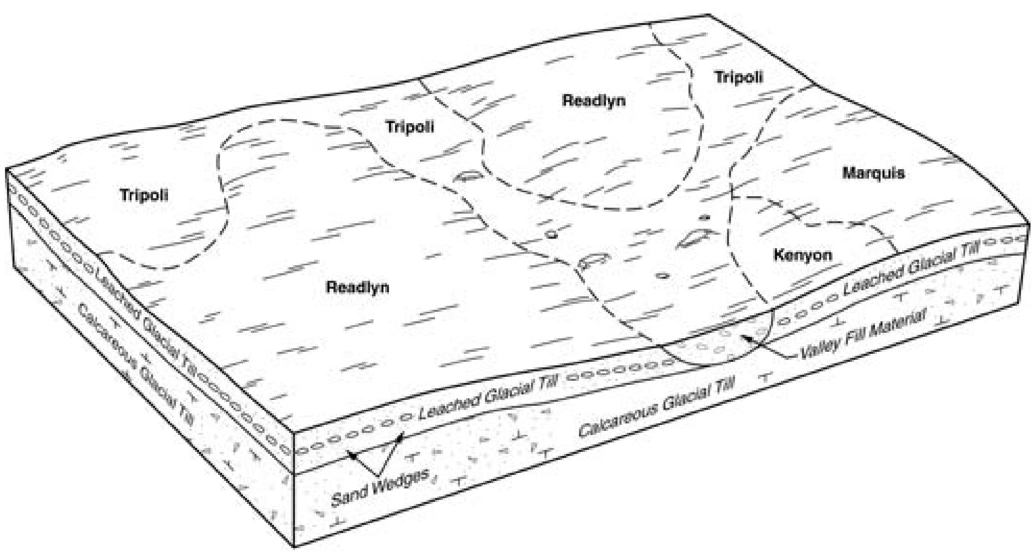

Figure 3.—Typical pattern of soils and parent material in the Tripoli-Readlyn association.

Ponding: None
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 4.8 percent

Soils of Minor Extent

Marquis and similar soils
Extent: 0 to 15 percent of the association

Kenyon and similar soils
Extent: 0 to 15 percent of the association

3. Klinger-Maxfield Association (fig. 4)

Extent of the association in the survey area: 4 percent

Component Description

Klinger
Extent: 35 to 55 percent of the association
Position on the landscape: Interfluves and long side slopes
Slope range: 1 to 3 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None

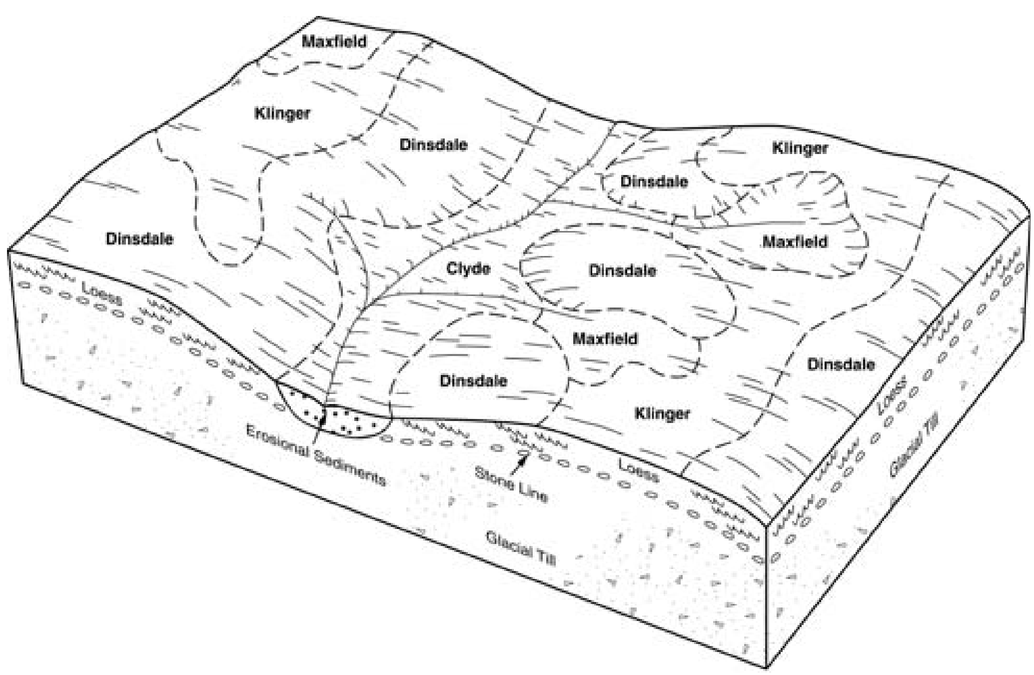

Figure 4.—Typical pattern of soils and parent material in the Klinger-Maxfield association.

Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 5.2 percent

Maxfield
Extent: 30 to 50 percent of the association
Position on the landscape: Upland flats
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 6.6 percent

Soils of Minor Extent

Dinsdale and similar soils
Extent: 0 to 20 percent of the association

Clyde and similar soils
Extent: 0 to 15 percent of the association

4. Spillville-Waukee-Coland Association (fig. 5)

Extent of the association in the survey area: 12 percent

Component Description

Spillville
Extent: 25 to 45 percent of the association
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 4.1 percent

Waukee
Extent: 15 to 35 percent of the association
Position on the landscape: Stream terraces
Slope range: 0 to 9 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)

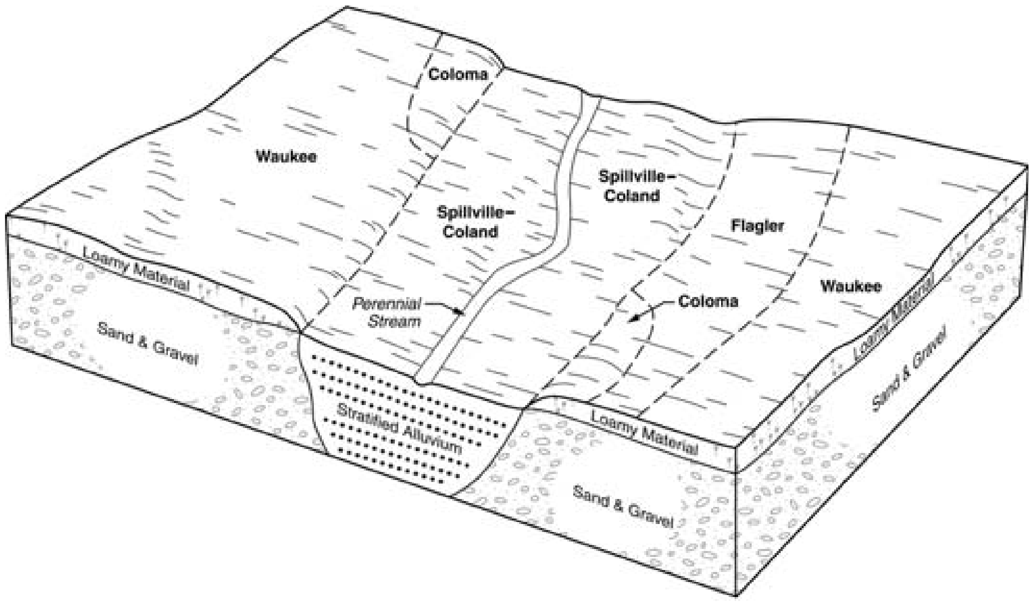

Figure 5.—Typical pattern of soils and parent material in the Spillville-Waukee-Coland association.

Drainage class: Well drained
Parent material: Loamy alluvium over sandy and gravelly alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.4 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Coland
Extent: 15 to 35 percent of the association
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.4 inches
Content of organic matter in the upper 10 inches: 5.7 percent

Soils of Minor Extent

Coloma and similar soils
Extent: 0 to 20 percent of the association

Flagler and similar soils
Extent: 0 to 15 percent of the association

5. Marshan-Sigglekov-Hayfield Association

Extent of the association in the survey area: 14 percent

Component Description

Marshan

Extent: 25 to 45 percent of the association
Position on the landscape: Stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy alluvium over sandy and gravelly alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 7.0 inches
Content of organic matter in the upper 10 inches: 5.1 percent

Sigglekov

Extent: 20 to 40 percent of the association
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Sandy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Frequent (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 2.8 inches
Content of organic matter in the upper 10 inches: 0.9 percent

Hayfield

Extent: 15 to 35 percent of the association
Position on the landscape: Stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy alluvium over sandy and gravelly alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 7.0 inches
Content of organic matter in the upper 10 inches: 2.9 percent

Soils of Minor Extent

Waukee, rarely flooded, and similar soils
Extent: 0 to 20 percent of the association

6. Sparta-Rockton-Kenyon Association

Extent of the association in the survey area: 5 percent

Component Description

Sparta
Extent: 40 to 60 percent of the association
Position on the landscape: Summits and shoulders
Slope range: 2 to 9 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.2 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Rockton
Extent: 20 to 40 percent of the association
Position on the landscape: Summits, shoulders, and side slopes
Slope range: 2 to 14 percent
Texture of the surface layer: Loam
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Parent material: Loamy sediments over clayey residuum over limestone or dolomite
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.7 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Kenyon
Extent: 10 to 30 percent of the association
Position on the landscape: Summits, shoulders, and side slopes
Slope range: 2 to 9 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 3.3 percent

7. Seaton-Port Byron Association

Extent of the association in the survey area: 2 percent

Component Description

Seaton
Extent: 45 to 65 percent of the association
Position on the landscape: Ridgetops, shoulders, and side slopes
Slope range: 2 to 40 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Port Byron
Extent: 20 to 40 percent of the association
Position on the landscape: Ridgetops, shoulders, and side slopes
Slope range: 2 to 9 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.3 inches
Content of organic matter in the upper 10 inches: 3.1 percent

Soils of Minor Extent

Orion, occasionally flooded, and similar soils
Extent: 0 to 20 percent of the association

Chelsea and similar soils
Extent: 0 to 15 percent of the association

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and lists some of the principal soil properties that should be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. The soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of

the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Readlyn loam, 1 to 3 percent slopes, is a phase of the Readlyn series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Spillville-Coland complex, 0 to 2 percent slopes, occasionally flooded, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The map unit Pits, limestone quarries, is an example.

The table “Acreage and Proportionate Extent of the Soils” in Part II lists the map units in this survey area. Other tables provided in Part II give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

41B—Sparta loamy fine sand, 2 to 5 percent slopes

Component Description

Sparta and similar soils
Extent: 60 to 100 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 2 to 5 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.2 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Minor Dissimilar Components

Dickinson and similar soils
Extent: 0 to 30 percent of the unit

Olin and similar soils
Extent: 0 to 10 percent of the unit

41C—Sparta loamy fine sand, 5 to 9 percent slopes

Component Description

Sparta and similar soils
Extent: 60 to 100 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 5 to 9 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits

Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.2 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Minor Dissimilar Components

Olin and similar soils
Extent: 0 to 20 percent of the unit

Dickinson and similar soils
Extent: 0 to 20 percent of the unit

43—Bremer silty clay loam, 0 to 2 percent slopes, rarely flooded

Component Description

Bremer and similar soils
Extent: 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.2 inches
Content of organic matter in the upper 10 inches: 5.8 percent

50B—Coloma loamy sand, 2 to 5 percent slopes, rarely flooded

Component Description

Coloma and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 2 to 5 percent
Texture of the surface layer: Loamy sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy glaciofluvial deposits
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None

Available water capacity to a depth of 60 inches: 3.7 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Minor Dissimilar Components

Burkhardt and similar soils
Extent: 0 to 25 percent of the unit

63B—Chelsea loamy fine sand, 2 to 5 percent slopes

Component Description

Chelsea and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Summits
Slope range: 2 to 5 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.7 inches
Content of organic matter in the upper 10 inches: 0.9 percent

Minor Dissimilar Components

Olin and similar soils
Extent: 0 to 25 percent of the unit

Dickinson and similar soils
Extent: 0 to 25 percent of the unit

63C—Chelsea loamy fine sand, 5 to 9 percent slopes

Component Description

Chelsea and similar soils
Extent: 60 to 100 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 5 to 9 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.7 inches
Content of organic matter in the upper 10 inches: 0.9 percent

Minor Dissimilar Components

Billett and similar soils
Extent: 0 to 40 percent of the unit

63E—Chelsea loamy fine sand, 9 to 18 percent slopes

Component Description

Chelsea and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 18 percent
Texture of the surface layer: Loamy fine sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 4.7 inches
Content of organic matter in the upper 10 inches: 0.9 percent

Minor Dissimilar Components

Seaton, moderately eroded, and similar soils
Extent: 0 to 25 percent of the unit

83B—Kenyon loam, 2 to 5 percent slopes

Component Description

Kenyon and similar soils
Extent: 60 to 100 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Minor Dissimilar Components

Ostrander and similar soils
Extent: 0 to 40 percent of the unit

83C—Kenyon loam, 5 to 9 percent slopes

Component Description

Kenyon and similar soils
Extent: 60 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)

Drainage class: Moderately well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Minor Dissimilar Components

Ostrander and similar soils
Extent: 0 to 40 percent of the unit

84—Clyde silty clay loam, 0 to 3 percent slopes

Component Description

Clyde and similar soils
Extent: 75 to 95 percent of the unit
Position on the landscape: Drainageways
Slope range: 0 to 3 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 7.0 percent

Minor Dissimilar Components

Floyd and similar soils
Extent: 5 to 25 percent of the unit

Clyde, frequently flooded, and similar soils
Extent: 0 to 10 percent of the unit

109B—Backbone sandy loam, 2 to 5 percent slopes

Component Description

Backbone and similar soils
Extent: 100 percent of the unit
Position on the landscape: Ridgetops
Slope range: 2 to 5 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Parent material: Moderately coarse or coarse eolian material with or without a thin layer of residuum overlying limestone bedrock
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None

Available water capacity to a depth of 60 inches: 3.8 inches
Content of organic matter in the upper 10 inches: 1.3 percent

109C—Backbone sandy loam, 5 to 9 percent slopes

Component Description

Backbone and similar soils
Extent: 100 percent of the unit
Position on the landscape: Ridgetops and shoulders
Slope range: 5 to 9 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Parent material: Moderately coarse or coarse eolian material with or without a thin layer of residuum overlying limestone bedrock
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 3.8 inches
Content of organic matter in the upper 10 inches: 1.3 percent

109D—Backbone sandy loam, 9 to 14 percent slopes

Component Description

Backbone and similar soils
Extent: 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Parent material: Moderately coarse or coarse eolian material with or without a thin layer of residuum overlying limestone bedrock
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 3.8 inches
Content of organic matter in the upper 10 inches: 1.3 percent

127—Plano silty clay loam, 0 to 2 percent slopes, rarely flooded

Component Description

Plano, rarely flooded, and similar soils
Extent: 70 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Silty material and the underlying loamy stratified outwash

Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 10.9 inches
Content of organic matter in the upper 10 inches: 3.6 percent

Minor Dissimilar Components

Waukee, rarely flooded, and similar soils
Extent: 0 to 30 percent of the unit

135—Coland clay loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Coland, occasionally flooded, and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.4 inches
Content of organic matter in the upper 10 inches: 5.7 percent

Minor Dissimilar Components

Marshan, rarely flooded, and similar soils
Extent: 0 to 25 percent of the unit

Spillville, occasionally flooded, and similar soils
Extent: 0 to 25 percent of the unit

153—Shandep loam, ponded, 0 to 1 percent slopes, occasionally flooded

Component Description

Shandep, ponded, occasionally flooded, and similar soils
Extent: 50 to 100 percent of the unit
Position on the landscape: Depressions on stream terraces
Slope range: 0 to 1 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained

Parent material: Loamy alluvium over sandy and gravelly alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Months in which ponding does not occur: January, December
Deepest ponding: 0.5 foot (February, March, April, May, June, July, August, September, October, November)
Available water capacity to a depth of 60 inches: 9.4 inches
Content of organic matter in the upper 10 inches: 8.0 percent

Minor Dissimilar Components

Marshan, rarely flooded, and similar soils
Extent: 0 to 50 percent of the unit

173—Hoopeston sandy loam, terrace, 0 to 2 percent slopes, rarely flooded

Component Description

Hoopeston, rarely flooded, and similar soils
Extent: 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy and sandy glaciofluvial deposits
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 7.3 inches
Content of organic matter in the upper 10 inches: 2.5 percent

175B—Dickinson fine sandy loam, 2 to 5 percent slopes

Component Description

Dickinson and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 2 to 5 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Glacial or alluvial sediments reworked by wind
Flooding: None
Depth to wet zone: More than 6.7 feet all year

Ponding: None
Available water capacity to a depth of 60 inches: 5.4 inches
Content of organic matter in the upper 10 inches: 1.9 percent

Minor Dissimilar Components

Sparta and similar soils
Extent: 0 to 25 percent of the unit

175C—Dickinson fine sandy loam, 5 to 9 percent slopes

Component Description

Dickinson and similar soils
Extent: 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Glacial or alluvial sediments reworked by wind
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.4 inches
Content of organic matter in the upper 10 inches: 1.9 percent

178—Waukee loam, 0 to 2 percent slopes, rarely flooded

Component Description

Waukee, rarely flooded, and similar soils
Extent: 70 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy alluvium over sandy and gravelly alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.4 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Minor Dissimilar Components

Lawler, rarely flooded, and similar soils
Extent: 0 to 15 percent of the unit

Saude, rarely flooded, and similar soils
Extent: 0 to 15 percent of the unit

178B—Waukee loam, 2 to 5 percent slopes, rarely flooded

Component Description

Waukee, rarely flooded, and similar soils
Extent: 80 to 100 percent of the unit
Position on the landscape: Treads and risers on stream terraces
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy alluvium over sandy and gravelly alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.4 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Minor Dissimilar Components

Saude, rarely flooded, and similar soils
Extent: 0 to 20 percent of the unit

178C—Waukee loam, 5 to 9 percent slopes, rarely flooded

Component Description

Waukee, rarely flooded, and similar soils
Extent: 70 to 100 percent of the unit
Position on the landscape: Risers on stream terraces
Slope range: 5 to 9 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy alluvium over sandy and gravelly alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.4 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Minor Dissimilar Components

Saude, rarely flooded, and similar soils
Extent: 0 to 30 percent of the unit

184—Klinger silty clay loam, 1 to 3 percent slopes

Component Description

Klinger and similar soils
Extent: 100 percent of the unit
Position on the landscape: Interfluves and long side slopes (fig. 6)

Figure 6.—A newly established windbreak in an area of Klinger silty clay loam, 1 to 3 percent slopes.

Slope range: 1 to 3 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 5.2 percent

198B—Floyd loam, 1 to 4 percent slopes

Component Description

Floyd and similar soils
Extent: 80 to 100 percent of the unit
Position on the landscape: Concave footslopes adjacent to upland drainageways
Slope range: 1 to 4 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy sediments over subglacial till
Flooding: None

Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 10.7 inches
Content of organic matter in the upper 10 inches: 5.2 percent

Minor Dissimilar Components

Clyde and similar soils
Extent: 0 to 20 percent of the unit

221—Klossner muck, 1 to 3 percent slopes

Component Description

Klossner and similar soils
Extent: 100 percent of the unit
Position on the landscape: Fens; hillside seeps
Slope range: 1 to 3 percent
Texture of the surface layer: Muck
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Organic material overlying loamy deposits
Flooding: None
Wet zone: At the surface all year
Ponding: None
Available water capacity to a depth of 60 inches: 21.3 inches
Content of organic matter in the upper 10 inches: 75.0 percent

284B—Flagler sandy loam, 1 to 4 percent slopes, rarely flooded

Component Description

Flagler and similar soils
Extent: 80 to 100 percent of the unit
Position on the landscape: Treads and risers on stream terraces
Slope range: 1 to 4 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Moderately coarse textured alluvium over coarse textured alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.0 inches
Content of organic matter in the upper 10 inches: 1.9 percent

Minor Dissimilar Components

Burkhardt and similar soils
Extent: 0 to 20 percent of the unit

285—Burkhardt sandy loam, 0 to 2 percent slopes, rarely flooded

Component Description

Burkhardt and similar soils
Extent: 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Loamy alluvium over sandy outwash
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 3.6 inches
Content of organic matter in the upper 10 inches: 2.0 percent

285C—Burkhardt sandy loam, 2 to 9 percent slopes, rarely flooded

Component Description

Burkhardt and similar soils
Extent: 100 percent of the unit
Position on the landscape: Risers on stream terraces
Slope range: 2 to 9 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Loamy alluvium over sandy outwash
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 3.6 inches
Content of organic matter in the upper 10 inches: 2.0 percent

323B—Fort Dodge loam, 1 to 4 percent slopes

Component Description

Fort Dodge and similar soils
Extent: 50 to 100 percent of the unit
Position on the landscape: Upland drainageways and footslopes
Slope range: 1 to 4 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy alluvium and/or loamy colluvium

Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Waukee, rarely flooded, and similar soils
Extent: 0 to 50 percent of the unit

344D—Copaston loam, 5 to 14 percent slopes

Component Description

Copaston and similar soils
Extent: 85 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 5 to 14 percent
Texture of the surface layer: Loam
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Parent material: Loamy sediments over limestone
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 2.9 inches
Content of organic matter in the upper 10 inches: 2.7 percent

Minor Dissimilar Components

Rockton and similar soils
Extent: 0 to 15 percent of the unit

344G—Copaston loam, 14 to 30 percent slopes

Component Description

Copaston and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 14 to 30 percent
Texture of the surface layer: Loam
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Parent material: Loamy sediments over limestone
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 2.9 inches
Content of organic matter in the upper 10 inches: 2.7 percent

Minor Dissimilar Components

Rockton and similar soils
Extent: 0 to 15 percent of the unit

Rock outcrop
Extent: 0 to 20 percent of the unit

354—Aquolls, ponded, 0 to 1 percent slopes

Component Description

Aquolls, ponded, and similar soils
Extent: 80 to 100 percent of the unit
Position on the landscape: Depressions on flood plains
Slope range: 0 to 1 percent
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Alluvium
Flooding: None
Wet zone: At the surface all year
Shallowest ponding: 0.5 foot (August, September, October)
Deepest ponding: 2.0 feet (April, May)

Minor Dissimilar Components

Shandep, ponded, occasionally flooded, and similar soils
Extent: 0 to 20 percent of the unit

377B—Dinsdale silty clay loam, 2 to 5 percent slopes

Component Description

Dinsdale and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Shoulders and ridgetops
Slope range: 2 to 5 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Minor Dissimilar Components

Kenyon and similar soils
Extent: 0 to 25 percent of the unit

377C—Dinsdale silty clay loam, 5 to 9 percent slopes

Component Description

Dinsdale and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 5 to 9 percent

Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 4.0 feet (April)
Deepest depth to wet zone: 6.5 feet (August, September, October)
Ponding: None
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Minor Dissimilar Components

Kenyon and similar soils
Extent: 0 to 25 percent of the unit

382—Maxfield silty clay loam, 0 to 2 percent slopes

Component Description

Maxfield and similar soils
Extent: 100 percent of the unit
Position on the landscape: Upland flats
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 6.6 percent

391B—Clyde-Floyd complex, 1 to 4 percent slopes

Component Description

Clyde and similar soils
Extent: 55 to 75 percent of the unit
Position on the landscape: Upland drainageways (fig. 7)
Slope range: 1 to 3 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 7.0 percent

Figure 7.—Ponds are common grade-stabilization structures. Pictured is an area of Clyde-Floyd complex, 1 to 4 percent slopes. Kenyon loam, 2 to 5 percent slopes, is in the background.

Floyd and similar soils
Extent: 25 to 45 percent of the unit
Position on the landscape: Concave footslopes
Slope range: 1 to 4 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 10.7 inches
Content of organic matter in the upper 10 inches: 5.2 percent

Minor Dissimilar Components

Clyde, frequently flooded, and similar soils
Extent: 0 to 10 percent of the unit

394B—Ostrander loam, 2 to 5 percent slopes

Component Description

Ostrander and similar soils
Extent: 50 to 100 percent of the unit
Position on the landscape: Summits and shoulders

Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Kenyon and similar soils
Extent: 0 to 50 percent of the unit

394C—Ostrander loam, 5 to 9 percent slopes

Component Description

Ostrander and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Kenyon and similar soils
Extent: 0 to 25 percent of the unit

395B—Marquis loam, 2 to 5 percent slopes

Component Description

Marquis and similar soils
Extent: 55 to 100 percent of the unit
Position on the landscape: Shoulders
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 2.0 feet (April)
Deepest depth to wet zone: 5.0 feet (September)
Ponding: None

Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Kenyon and similar soils
Extent: 0 to 25 percent of the unit

Readlyn and similar soils
Extent: 0 to 20 percent of the unit

398—Tripoli clay loam, 0 to 2 percent slopes

Component Description

Tripoli and similar soils
Extent: 80 to 100 percent of the unit
Position on the landscape: Upland flats
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.1 inches
Content of organic matter in the upper 10 inches: 6.2 percent

Minor Dissimilar Components

Readlyn and similar soils
Extent: 0 to 20 percent of the unit

399—Readlyn loam, 1 to 3 percent slopes

Component Description

Readlyn and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Slightly convex side slopes
Slope range: 1 to 3 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 4.8 percent

Minor Dissimilar Components

Tripoli and similar soils
Extent: 0 to 25 percent of the unit

408B—Olin fine sandy loam, 2 to 5 percent slopes

Component Description

Olin and similar soils
Extent: 65 to 100 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 2 to 5 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 9.5 inches
Content of organic matter in the upper 10 inches: 1.9 percent

Minor Dissimilar Components

Sparta and similar soils
Extent: 0 to 15 percent of the unit

Kenyon and similar soils
Extent: 0 to 20 percent of the unit

471—Oran loam, 1 to 3 percent slopes

Component Description

Oran and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 1 to 3 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.0 inches
Content of organic matter in the upper 10 inches: 2.9 percent

Minor Dissimilar Components

Tripoli and similar soils
Extent: 0 to 25 percent of the unit

485—Spillville loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Spillville, occasionally flooded, and similar soils
Extent: 75 to 85 percent of the unit

Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 4.1 percent

Minor Dissimilar Components

Coland, occasionally flooded, and similar soils
Extent: 0 to 20 percent of the unit

Marshan, rarely flooded, and similar soils
Extent: 0 to 15 percent of the unit

582B—Kasson loam, 2 to 5 percent slopes

Component Description

Kasson and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 2.0 feet (April)
Deepest depth to wet zone: 5.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.0 inches
Content of organic matter in the upper 10 inches: 2.5 percent

Minor Dissimilar Components

Bassett and similar soils
Extent: 0 to 25 percent of the unit

582C—Kasson loam, 5 to 9 percent slopes

Component Description

Kasson and similar soils
Extent: 50 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Loam

Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over subglacial till
Flooding: None
Shallowest depth to wet zone: 2.0 feet (April)
Deepest depth to wet zone: 5.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.0 inches
Content of organic matter in the upper 10 inches: 2.5 percent

Minor Dissimilar Components

Bassett and similar soils
Extent: 0 to 50 percent of the unit

585—Spillville-Coland complex, 0 to 2 percent slopes, occasionally flooded

Component Description

Spillville, occasionally flooded, and similar soils
Extent: 25 to 75 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 4.1 percent

Coland, occasionally flooded, and similar soils
Extent: 0 to 50 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.4 inches
Content of organic matter in the upper 10 inches: 5.7 percent

Minor Dissimilar Components

Marshan, rarely flooded, and similar soils
Extent: 0 to 50 percent of the unit

620B—Port Byron silt loam, 2 to 5 percent slopes

Component Description

Port Byron and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Ridgetops
Slope range: 2 to 5 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.3 inches
Content of organic matter in the upper 10 inches: 3.1 percent

Minor Dissimilar Components

Joy and similar soils
Extent: 0 to 25 percent of the unit

620C2—Port Byron silt loam, 5 to 9 percent slopes, moderately eroded

Component Description

Port Byron and similar soils
Extent: 100 percent of the unit
Position on the landscape: Shoulders and side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.3 inches
Content of organic matter in the upper 10 inches: 2.1 percent

626—Hayfield loam, 0 to 2 percent slopes, rarely flooded

Component Description

Hayfield, rarely flooded, and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent

Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy alluvium over sandy alluvium or sandy and gravelly alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 7.0 inches
Content of organic matter in the upper 10 inches: 2.9 percent

Minor Dissimilar Components

Marshan, rarely flooded, and similar soils
Extent: 0 to 25 percent of the unit

663B—Seaton silt loam, 2 to 5 percent slopes

Component Description

Seaton and similar soils
Extent: 100 percent of the unit
Position on the landscape: Ridgetops
Slope range: 2 to 5 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 1.3 percent

663C—Seaton silt loam, 5 to 9 percent slopes

Component Description

Seaton and similar soils
Extent: 100 percent of the unit
Position on the landscape: Shoulders and ridgetops
Slope range: 5 to 9 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 1.3 percent

663D2—Seaton silt loam, 9 to 14 percent slopes, moderately eroded

Component Description

Seaton, moderately eroded, and similar soils
Extent: 80 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 0.9 percent

Minor Dissimilar Components

Seaton, severely eroded, and similar soils
Extent: 0 to 20 percent of the unit

663D3—Seaton silt loam, 9 to 14 percent slopes, severely eroded

Component Description

Seaton, severely eroded, and similar soils
Extent: 50 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 0.5 percent

Minor Dissimilar Components

Seaton, moderately eroded, and similar soils
Extent: 0 to 50 percent of the unit

663E2—Seaton silt loam, 14 to 18 percent slopes, moderately eroded

Component Description

Seaton, moderately eroded, and similar soils
Extent: 80 to 100 percent of the unit

Position on the landscape: Side slopes
Slope range: 14 to 18 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 0.9 percent

Minor Dissimilar Components

Seaton, severely eroded, and similar soils
Extent: 0 to 20 percent of the unit

663G—Seaton silt loam, 18 to 40 percent slopes

Component Description

Seaton and similar soils
Extent: 60 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 18 to 40 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 12.6 inches
Content of organic matter in the upper 10 inches: 1.0 percent

Minor Dissimilar Components

Chelsea and similar soils
Extent: 0 to 40 percent of the unit

775—Billett sandy loam, 0 to 2 percent slopes

Component Description

Billett and similar soils
Extent: 100 percent of the unit
Position on the landscape: Summits
Slope range: 0 to 2 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None

Available water capacity to a depth of 60 inches: 6.3 inches
Content of organic matter in the upper 10 inches: 1.3 percent

775B—Billett sandy loam, 2 to 5 percent slopes

Component Description

Billett and similar soils
Extent: 100 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 2 to 5 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 6.3 inches
Content of organic matter in the upper 10 inches: 1.3 percent

775C—Billett sandy loam, 5 to 9 percent slopes

Component Description

Billett and similar soils
Extent: 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy eolian deposits
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 6.3 inches
Content of organic matter in the upper 10 inches: 1.3 percent

778—Sattre loam, 0 to 2 percent slopes, rarely flooded

Component Description

Sattre, rarely flooded, and similar soils
Extent: 50 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy alluvium over sandy and gravelly alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)

Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 7.0 inches
Content of organic matter in the upper 10 inches: 2.3 percent

Minor Dissimilar Components

Hayfield, rarely flooded, and similar soils
Extent: 0 to 50 percent of the unit

813B—Atkinson loam, 2 to 5 percent slopes

Component Description

Atkinson and similar soils
Extent: 40 to 100 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: 40 to 55 inches to lithic bedrock
Drainage class: Well drained
Parent material: Loamy sediments over clayey residuum over limestone
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 9.2 inches
Content of organic matter in the upper 10 inches: 3.4 percent

Minor Dissimilar Components

Rockton and similar soils
Extent: 0 to 60 percent of the unit

813C—Atkinson loam, 5 to 9 percent slopes

Component Description

Atkinson and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Loam
Depth to restrictive feature: 40 to 55 inches to lithic bedrock
Drainage class: Well drained
Parent material: Loamy sediments over clayey residuum over limestone
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 9.2 inches
Content of organic matter in the upper 10 inches: 3.4 percent

Minor Dissimilar Components

Rockton and similar soils
Extent: 0 to 25 percent of the unit

814B—Rockton loam, 2 to 5 percent slopes

Component Description

Rockton and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Summits and shoulders
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Parent material: Loamy sediments over clayey residuum over limestone
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.7 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Atkinson and similar soils
Extent: 0 to 25 percent of the unit

814C—Rockton loam, 5 to 9 percent slopes

Component Description

Rockton and similar soils
Extent: 60 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 5 to 9 percent
Texture of the surface layer: Loam
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Parent material: Loamy sediments over clayey residuum over limestone
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.7 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Atkinson and similar soils
Extent: 0 to 25 percent of the unit

Copaston and similar soils
Extent: 0 to 15 percent of the unit

814D—Rockton loam, 9 to 14 percent slopes

Component Description

Rockton and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Side slopes
Slope range: 9 to 14 percent

Texture of the surface layer: Loam
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Parent material: Loamy sediments over clayey residuum over limestone
Flooding: None
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.7 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Minor Dissimilar Components

Copaston and similar soils
Extent: 0 to 25 percent of the unit

884—Klingmore silty clay loam, 1 to 3 percent slopes

Component Description

Klingmore and similar soils
Extent: 100 percent of the unit
Position on the landscape: Slight upland rises
Slope range: 1 to 3 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 5.3 percent

930—Orion silt loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Orion, occasionally flooded, and similar soils
Extent: 100 percent of the unit
Position on the landscape: Upland drainageways
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Silty alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Occasional (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None

Available water capacity to a depth of 60 inches: 12.4 inches
Content of organic matter in the upper 10 inches: 2.0 percent

982—Maxmore silty clay loam, 0 to 2 percent slopes

Component Description

Maxmore and similar soils
Extent: 100 percent of the unit
Position on the landscape: Upland flats
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loess over subglacial till
Flooding: None
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 6.6 percent

1152—Marshan clay loam, 0 to 2 percent slopes, rarely flooded

Component Description

Marshan, rarely flooded, and similar soils
Extent: 60 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy alluvium over sandy and gravelly alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 7.0 inches
Content of organic matter in the upper 10 inches: 5.1 percent

Minor Dissimilar Components

Lawler, rarely flooded, and similar soils
Extent: 0 to 25 percent of the unit

Selmass, rarely flooded, and similar soils
Extent: 0 to 25 percent of the unit

Shandep, ponded, occasionally flooded, and similar soils
Extent: 0 to 25 percent of the unit

1226—Lawler loam, 0 to 2 percent slopes, rarely flooded

Component Description

Lawler, rarely flooded, and similar soils
Extent: 50 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy alluvium over sandy and gravelly alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 8.1 inches
Content of organic matter in the upper 10 inches: 4.3 percent

Minor Dissimilar Components

Marshan, rarely flooded, and similar soils
Extent: 0 to 25 percent of the unit

Waukee, rarely flooded, and similar soils
Extent: 0 to 25 percent of the unit

1585—Spillville, channeled-Coland, channeled-Aquolls, ponded, complex, 0 to 2 percent slopes, frequently flooded

Component Description

Spillville, channeled, and similar soils
Extent: 35 to 45 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Frequent (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 4.5 percent

Coland, channeled, and similar soils
Extent: 25 to 45 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam

Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Frequent (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 11.4 inches
Content of organic matter in the upper 10 inches: 6.0 percent

Aquolls, ponded, and similar soils
Extent: 5 to 25 percent of the unit
Position on the landscape: Depressions on flood plains
Slope range: 0 to 1 percent
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Frequent (February, March, April, May, June, July, August, September, October, November)
Wet zone: At the surface all year
Shallowest ponding: 0.5 foot (August, September, October)
Deepest ponding: 2.0 feet (April, May)

Minor Dissimilar Components

Marshan, rarely flooded, and similar soils
Extent: 5 to 15 percent of the unit

1586—Sigglekov-Fluvaquents, channeled-Aquents, ponded, complex, 0 to 2 percent slopes, frequently flooded

Component Description

Sigglekov, frequently flooded, and similar soils
Extent: 45 to 65 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Sandy alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Frequent (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: 1.0 foot (April)
Deepest depth to wet zone: 4.0 feet (September)
Ponding: None
Available water capacity to a depth of 60 inches: 2.8 inches
Content of organic matter in the upper 10 inches: 0.9 percent

Fluvaquents, frequently flooded, and similar soils
Extent: 20 to 40 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 2 percent
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Frequent (February, March, April, May, June, July, August, September, October, November)
Shallowest depth to wet zone: At the surface (April)
Deepest depth to wet zone: 3.0 feet (September)
Ponding: None

Aquents, ponded, and similar soils
Extent: 5 to 25 percent of the unit
Position on the landscape: Flood plains
Slope range: 0 to 1 percent
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Alluvium
Months in which flooding does not occur: January, December
Highest frequency of flooding: Frequent (February, March, April, May, June, July, August, September, October, November)
Wet zone: At the surface all year
Shallowest ponding: 0.5 foot (August, September, October)
Deepest ponding: 2.0 feet (April, May)

4946—Udorthents-Interstate highway complex, 0 to 5 percent slopes

Component Description

Udorthents and similar soils
Extent: 55 to 75 percent of the unit
Position on the landscape: Variable
Slope range: 0 to 5 percent
Depth to restrictive feature: Very deep (more than 60 inches)
Parent material: Loamy deposits
Flooding: None
Ponding: None

Interstate highway
Extent: 25 to 45 percent of the unit
Slope range: 0 to 5 percent

5010—Pits, sand and gravel

- This map unit consists of areas from which sand and gravel have been removed.

5030—Pits, limestone quarries

- This map unit consists of areas from which limestone has been removed.

5040—Udorthents, loamy

Component Description

Udorthents, loamy, and similar soils
Extent: 100 percent of the unit
Depth to restrictive feature: Very deep (more than 60 inches)
Parent material: Loamy deposits
Flooding: None
Ponding: None

5080—Udorthents, sanitary landfill

Component Description

Udorthents and similar soils
Extent: 100 percent of the unit
Depth to restrictive feature: Very deep (more than 60 inches)
Flooding: None
Ponding: None

8041—Sparta loamy sand, terrace, 0 to 2 percent slopes, rarely flooded

Component Description

Sparta, terrace, rarely flooded, and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Loamy sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy glaciofluvial deposits
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.2 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Minor Dissimilar Components

Dickinson, terrace, rarely flooded, and similar soils
Extent: 0 to 25 percent of the unit

Waukee, rarely flooded, and similar soils
Extent: 0 to 10 percent of the unit

8041B—Sparta loamy sand, terrace, 2 to 5 percent slopes, rarely flooded

Component Description

Sparta, terrace, rarely flooded, and similar soils
Extent: 75 to 100 percent of the unit
Position on the landscape: Treads and risers on stream terraces
Slope range: 2 to 5 percent
Texture of the surface layer: Loamy sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy glaciofluvial deposits
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.2 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Minor Dissimilar Components

Dickinson, terrace, rarely flooded, and similar soils
Extent: 0 to 25 percent of the unit

Waukee, rarely flooded, and similar soils
Extent: 0 to 15 percent of the unit

8175B—Dickinson fine sandy loam, terrace, 1 to 4 percent slopes, rarely flooded

Component Description

Dickinson, terrace, rarely flooded, and similar soils
Extent: 100 percent of the unit
Position on the landscape: Treads and risers on stream terraces
Slope range: 1 to 4 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Glacial or alluvial sediments reworked by wind
Months in which flooding does not occur: January, December
Highest frequency of flooding: Rare (February, March, April, May, June, July, August, September, October, November)
Depth to wet zone: More than 6.7 feet all year
Ponding: None
Available water capacity to a depth of 60 inches: 5.4 inches
Content of organic matter in the upper 10 inches: 1.9 percent

AW—Animal waste lagoon

- This map unit consists of shallow ponds constructed to hold animal waste from farm feedlots.

SL—Sewage lagoon

- This map unit consists of shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid waste.

W—Water

- This map unit consists of natural bodies of water.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999 and 2006). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Endoaquolls (*Endo*, meaning within, plus *aquoll*, the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Endoaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, superactive, mesic Typic Endoaquolls.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

The table “Classification of the Soils” in Part II of this publication indicates the order, suborder, great group, subgroup, and family of the soil series in the survey area.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (Soil Survey Staff, 1999) and in “Keys to Soil Taxonomy” (Soil Survey Staff, 2006). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

Atkinson Series

Typical Pedon

Atkinson loam, 2 to 5 percent slopes, in a cultivated field in Winneshiek County, Iowa, about 7 miles west of Fort Atkinson; about 465 feet east and 45 feet south of the northwest corner of sec. 18, T. 96 N., R. 10 W.; USGS Protivin SW (IA) topographic quadrangle; lat. 43 degrees 08 minutes 27.1 seconds N. and long. 92 degrees 04 minutes 46.2 seconds W., NAD 83:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak and moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A—7 to 13 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak and moderate fine granular structure; friable; slightly acid; clear smooth boundary.

BA—13 to 19 inches; dark brown (10YR 3/3) loam, brown (10YR 4/3) dry; weak fine and medium subangular blocky structure; friable; many fine and medium pores; few very dark brown (10YR 2/2) coatings on faces of peds; moderately acid; clear smooth boundary.

Bt1—19 to 24 inches; brown (10YR 4/3) loam; weak fine and medium subangular blocky structure; friable; common fine pores; common distinct dark yellowish brown (10YR 3/4) clay films on faces of peds and on surfaces along pores; stone line with a few cobbles up to 6 inches in diameter; moderately acid; abrupt smooth boundary.

Bt2—24 to 35 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; common fine pores; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds and on surfaces along pores; about 5 percent pebbles; moderately acid; clear smooth boundary.

Bt3—35 to 45 inches; yellowish brown (10YR 5/4 and 5/6) clay loam; moderate medium subangular blocky structure; firm; many fine pores; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds and on surfaces along pores; about 5 percent pebbles; moderately acid; abrupt wavy boundary.

2Bt4—45 to 50 inches; strong brown (7.5YR 5/6) clay; moderate fine and medium subangular blocky structure; very firm; moderately acid; abrupt wavy boundary.

3R—50 inches; hard, fractured limestone bedrock.

Range in Characteristics

Depth to bedrock: 40 to 60 inches

Other features: Some pedons have a 2Bt horizon, 10 to 20 inches thick, which is very flaggy clay, extremely flaggy clay, very flaggy silty clay, or extremely flaggy silty clay.

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam or silt loam
Reaction—moderately acid to neutral

BA horizon:
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—loam or silt loam
Reaction—moderately acid to neutral

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—loam, clay loam, or sandy clay loam
Reaction—moderately acid or slightly acid

2Bt horizon (where present):
Hue—5YR, 7.5YR, or 10YR
Value—3 to 6
Chroma—3 to 8
Texture—clay or silty clay
Reaction—moderately acid to neutral

Backbone Series

Typical Pedon

Backbone sandy loam, 2 to 5 percent slopes, in a cultivated field in Bremer County, Iowa; about 1,902 feet west and 103 feet south of the northeast corner of sec. 29, T. 91 N., R. 13 W.; USGS Waverly (IA) topographic quadrangle; lat. 42 degrees 40 minutes 16.1 seconds N. and long. 92 degrees 24 minutes 12.2 seconds W.; NAD 83:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; common very fine and fine roots; neutral; abrupt smooth boundary.
BE—8 to 13 inches; brown (10YR 4/3) sandy loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; very friable; common very fine and fine roots; neutral; clear smooth boundary.
Bt1—13 to 26 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine prismatic structure parting to weak fine subangular blocky; very friable; common very fine roots; few distinct dark brown (10YR 3/3) clay films on faces of peds; neutral; clear smooth boundary.
2Bt2—26 to 35 inches; dark yellowish brown (10YR 3/6) and yellowish brown (10YR 5/4) sandy clay loam; moderate fine subangular blocky structure; firm; common distinct dark brown (7.5YR 3/2) clay films on faces of peds; neutral; abrupt smooth boundary.
2R—35 inches; hard, fractured limestone bedrock.

Range in Characteristics

Depth to bedrock: 20 to 40 inches

Ap or A horizon:
Hue—10YR
Value—3
Chroma—1 or 2
Texture—sandy loam, fine sandy loam, or loamy sand
Reaction—moderately acid to neutral

BE or E horizon (where present):
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—sandy loam, fine sandy loam, or loamy sand
Reaction—strongly acid to neutral

Bt horizon:
Hue—10YR
Value—3 to 5
Chroma—3 to 5
Texture—sandy loam
Reaction—strongly acid to neutral

2Bt horizon:
Hue—5YR, 7.5YR, or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—clay loam, sandy clay loam, or clay
Reaction—moderately acid to neutral

Bassett Series

Typical Pedon

Bassett loam, on a southwest-facing, convex slope of about 2 percent, in a cultivated field in Howard County, Iowa, about 10 miles west of the town of Lime Springs; about 670 feet east and 500 feet north of the southwest corner of sec. 24, T. 100 N., R. 14 W.; USGS Lime Springs NW (IA) topographic quadrangle; lat. 43 degrees 27 minutes 33.8 seconds N. and long. 92 degrees 27 minutes 11.8 seconds W.; NAD 83:

Ap—0 to 8 inches; loam, very dark brown (10YR 2/2) with some mixing of brown (10YR 4/3), grayish brown (2.5Y 5/2) dry; weak fine granular structure; friable; slightly acid; clear smooth boundary.

E—8 to 10 inches; brown (10YR 4/3) loam; weak medium platy structure; friable; many distinct dark brown (10YR 3/3) and very dark grayish brown (10YR 3/2) coatings on faces of peds; pale brown (10YR 6/3) and grayish brown (10YR 5/2) (dry) silt and sand coatings on faces of peds; strongly acid; clear wavy boundary.

BE—10 to 14 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; common fine pores; dark brown (10YR 3/3) coatings on faces of peds; pale brown (10YR 6/3) (dry) silt and sand coatings on faces of peds; concentration of rock fragments ($^1/_8$ inch to 3 inches in diameter) in 1- to 3-inch-thick layer in the lower part; very strongly acid; clear smooth boundary.

2Bt1—14 to 22 inches; yellowish brown (10YR 5/6) loam; weak medium prismatic structure parting to moderate fine subangular blocky; friable; few fine and medium pores; brown (10YR 5/3) and yellowish brown (10YR 5/4) coatings on faces of peds; few fine strong brown (7.5YR 5/6) accumulations (oxides); about 2 percent rock fragments ($^1/_8$ inch to 3 inches in diameter); very strongly acid; gradual smooth boundary.

2Bt2—22 to 30 inches; yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) loam; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common fine pores; few dark gray (10YR 4/1) clay films on faces of peds; brown (10YR 5/3) coatings on faces of peds; few fine dark reddish brown (5YR 2/2) and yellowish red (5YR 4/6) accumulations (oxides); common fine distinct grayish brown (2.5Y 5/2) redoximorphic depletions; about 2 percent rock fragments ($^1/_8$ inch to 3 inches in diameter); strongly acid; gradual smooth boundary.

2Bt3—30 to 43 inches; yellowish brown (10YR 5/8) and grayish brown (2.5Y 5/2) loam; moderate coarse prismatic structure parting to weak medium subangular blocky; firm; few medium and fine pores; many grayish brown (2.5Y 5/2) coatings and common dark gray (10YR 4/1) clay films on faces of peds and in pores and root channels; few fine dark reddish brown (5YR 2/2) and yellowish red (5YR 5/8) accumulations (oxides); about 2 percent rock fragments ($^1/_8$ inch to 3 inches in diameter); strongly acid; gradual smooth boundary.

2Bt4—43 to 59 inches; yellowish brown (10YR 5/8) and light olive gray (5Y 6/2) loam; very weak coarse prismatic structure parting to weak coarse subangular blocky; firm; few dark gray (10YR 4/1) clay films in root channels in the upper part of the horizon; few fine dark reddish brown (5YR 2/2) and few fine yellowish red (5YR 5/8) accumulations (oxides); about 2 percent rock fragments ($^1/_8$ inch to 3 inches in diameter); slightly acid; clear wavy boundary.

2BC1—59 to 67 inches; yellowish brown (10YR 5/8) loam; extremely coarse prismatic structure dissected by few oblique fractures; very firm; many coarse prominent gray (5Y 6/1) redoximorphic depletions; about 4 percent rock fragments ($^1/_8$ inch to 3 inches in diameter); neutral; clear wavy boundary.

2BC2—67 to 73 inches; yellowish brown (10YR 5/8) loam; extremely coarse prismatic structure dissected by few oblique fractures; very firm; many coarse prominent gray (5Y 6/1) redoximorphic depletions; about 4 percent rock fragments ($^1/_8$ inch to 3 inches in diameter); strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to till: 12 to 30 inches
Depth to carbonates: 48 to 80 inches
Other features: Some pedons have a stone line or thin layer (1 to 5 inches thick) of gravelly and sandy materials at the base of the silty or loamy sediments. Also, in some cultivated areas the E horizon is mixed in with the Ap horizon.

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loam or silt loam
Content of rock fragments—1 to 10 percent
Reaction—strongly acid to neutral

E horizon (where present):
Hue—10YR
Value—3 to 5
Chroma—2 or 3
Texture—loam or silt loam
Content of rock fragments—1 to 10 percent
Reaction—very strongly acid to neutral

BE horizon (where present):
Hue—7.5YR or 10YR

Value—4 or 5
Chroma—3 to 6
Texture—loam or silt loam
Content of rock fragments—1 to 10 percent
Reaction—very strongly acid to slightly acid

2Bt horizon:
Hue—7.5YR to 5Y
Value—4 to 8
Chroma—1 to 8
Texture—loam, clay loam, or sandy clay loam
Content of rock fragments—2 to 15 percent
Reaction—very strongly acid to slightly acid

2BC horizon:
Hue—7.5YR to 5Y
Value—4 to 8
Chroma—1 to 8
Texture—loam
Content of rock fragments—2 to 12 percent
Reaction—slightly acid to moderately alkaline

Billett Series

Typical Pedon

Billett sandy loam, 2 to 5 percent slopes, in a cultivated field on uplands in Bremer County, Iowa; about 1,424 feet south and 782 feet east of the northwest corner of sec. 15, T. 92 N., R. 14 W.; USGS Plainfield (IA) topographic quadrangle; lat. 42 degrees 47 minutes 03.2 seconds N. and long. 92 degrees 29 minutes 31.9 seconds W.; NAD 83:

Ap—0 to 9 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; common very fine and fine roots; moderately acid; abrupt smooth boundary.

E—9 to 15 inches; brown (10YR 4/3) sandy loam, brown (10YR 5/3) dry; weak medium platy structure; friable; common very fine roots; very few distinct very dark grayish brown (10YR 3/2) organic stains on faces of peds; moderately acid; gradual smooth boundary.

Bt1—15 to 26 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; few very fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt2—26 to 51 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; gradual smooth boundary.

BC—51 to 68 inches; yellowish brown (10YR 5/4) loamy sand; weak coarse subangular blocky structure; very friable; slightly acid; gradual smooth boundary.

C—68 to 80 inches; dark yellowish brown (10YR 4/4) loamy fine sand; massive; very friable; common fine distinct dark gray (10YR 4/1) iron depletions; common fine prominent yellowish red (5YR 4/6) iron masses; slightly acid.

Range in Characteristics

Ap or A horizon:
Hue—7.5YR or 10YR
Value—2 or 3

Chroma—1 to 3
Texture—fine sandy loam, sandy loam, or loam
Reaction—moderately acid to slightly alkaline

E horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—2 to 4
Texture—sandy loam or fine sandy loam
Reaction—strongly acid to neutral

Bt or BC horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—sandy loam, fine sandy loam, loamy sand, or loamy fine sand; subhorizons of loam or sandy clay loam in the upper part of some pedons
Reaction—moderately acid or slightly acid

C horizon:
Hue—7.5YR or 10YR
Value—4 to 7
Chroma—3 to 6
Texture—loamy sand, sand, loamy fine sand, or fine sand or the gravelly analogs of these textures
Reaction—strongly acid to slightly alkaline

Bremer Series

Typical Pedon

Bremer silty clay loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field in Bremer County, Iowa; about 300 feet north and 2,011 feet east of the southwest corner of sec. 32, T. 91 N., R. 14 W.; USGS Shell Rock (IA) topographic quadrangle; lat. 42 degrees 38 minutes 35.2 seconds N. and long. 92 degrees 31 minutes 36.1 seconds W.; NAD 83:

Ap—0 to 11 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine granular structure; firm; slightly acid; abrupt smooth boundary.
Btg1—11 to 17 inches; dark gray (2.5Y 4/1) silty clay; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; common distinct dark gray (5Y 4/1) organic stains on faces of peds; common fine prominent brown (10YR 5/3) iron concentrations; moderately acid; clear wavy boundary.
Btg2—17 to 25 inches; grayish brown (2.5Y 5/2) silty clay; moderate fine and medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few distinct dark gray (5Y 4/1) organic stains on faces of peds; common medium prominent dark yellowish brown (10YR 4/6) masses of oxidized iron; moderately acid; gradual wavy boundary.
Btg3—25 to 34 inches; olive gray (5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few distinct dark gray (5Y 4/1) organic stains on faces of peds; few fine prominent dark yellowish brown (10YR 4/6) masses of oxidized iron; moderately acid; gradual wavy boundary.
Btg4—34 to 51 inches; olive gray (5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few distinct dark gray (5Y 4/1) organic stains on faces of peds; common medium prominent

yellowish red (5YR 4/6) masses of oxidized iron; moderately acid; gradual wavy boundary.

BCg—51 to 58 inches; olive gray (5Y 4/2) silty clay loam; weak coarse subangular blocky structure; firm; common coarse prominent yellowish red (5YR 4/6) masses of oxidized iron; slightly acid; clear wavy boundary.

Cg—58 to 80 inches; gray (5Y 6/1) silty clay loam; massive; firm; few coarse prominent yellowish red (5YR 4/6) masses of oxidized iron; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 36 inches
Depth to carbonates: More than 60 inches
Other features: Some pedons have sandy materials below a depth of 60 inches.
Note: The Bremer soils in Bremer County typically have a thinner mollic epipedon and a thicker argillic horizon than defined as the range for the series.

Ap or A horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam
Reaction—moderately acid to neutral

Bt or Btg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 5
Chroma—1 or 2
Texture—silty clay loam or silty clay
Reaction—moderately acid to neutral

BCg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam
Reaction—moderately acid to neutral

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam
Reaction—moderately acid to slightly alkaline

Burkhardt Series

Typical Pedon

Burkhardt sandy loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field in Bremer County, Iowa; about 1,530 feet west and 105 feet south of the northeast corner of sec. 5, T. 92 N., R. 14 W.; USGS Plainfield (IA) topographic quadrangle; lat. 42 degrees 49 minutes 05 seconds N. and long. 92 degrees 31 minutes 15 seconds W.; NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) sandy loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.

A—8 to 14 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; friable; slightly acid; clear smooth boundary.
Bt—14 to 19 inches; very dark grayish brown (10YR 3/2) sandy loam; weak fine subangular blocky structure; very friable; common distinct dark brown (10YR 3/3) clay films on faces of peds; about 5 percent rounded mixed rock fragments; moderately acid; clear smooth boundary.
2C1—19 to 35 inches; dark yellowish brown (10YR 4/6), stratified sand and gravelly coarse sand; single grain; loose; about 20 percent gravel; moderately acid; gradual wavy boundary.
2C2—35 to 80 inches; dark yellowish brown (10YR 4/4), stratified sand and gravelly coarse sand; single grain; loose; about 25 percent gravel; moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to sandy outwash: 10 to 20 inches
Depth to carbonates: More than 40 inches

A or Ap horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam, loam, gravelly sandy loam, or gravelly loam
Content of rock fragments—0 to 35 percent gravel and 0 to 5 percent cobbles
Reaction—strongly acid to neutral

AB horizon (where present):
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—2 or 3
Texture—sandy loam, loam, gravelly sandy loam, or gravelly loam
Content of rock fragments—0 to 35 percent gravel and 0 to 5 percent cobbles
Reaction—strongly acid to neutral

Bt or Bw horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—2 to 4
Texture—sandy loam, loam, gravelly sandy loam, or gravelly loam
Content of rock fragments—0 to 35 percent gravel and 0 to 5 percent cobbles
Reaction—strongly acid to neutral

2Bt and 2BC horizons (where present):
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—4 to 6
Texture—sand, coarse sand, loamy sand, or loamy coarse sand or the gravelly or very gravelly analogs of these textures; or stratified with these textures
Content of rock fragments—5 to 35 percent gravel and 0 to 5 percent cobbles; up to 60 percent gravel in some individual strata
Reaction—strongly acid to neutral

2C horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 6

Texture—stratified sand, coarse sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly coarse sand
Content of rock fragments—5 to 35 percent gravel and 0 to 5 percent cobbles; up to 60 percent gravel in some individual strata
Reaction—moderately acid or slightly acid

Chelsea Series

Typical Pedon

Chelsea loamy fine sand, 2 to 5 percent slopes, in a timbered area in Bremer County, Iowa; about 2,154 feet north and 2,489 feet west of the southeast corner of sec. 28, T. 91 N., R. 14 W.; USGS Shell Rock (IA) topographic quadrangle; lat. 42 degrees 39 minutes 45.7 seconds N. and long. 92 degrees 30 minutes 19.6 seconds W.; NAD 83:

A1—0 to 4 inches; very dark gray (10YR 3/1) loamy fine sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; few very fine roots; slightly acid; abrupt smooth boundary.
A2—4 to 7 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; single grain; loose; few very fine roots; moderately acid; gradual smooth boundary.
E1—7 to 24 inches; dark yellowish brown (10YR 4/4) loamy fine sand; single grain; loose; strongly acid; gradual smooth boundary.
E2—24 to 43 inches; brown (10YR 4/3) loamy fine sand; single grain; loose; strongly acid; gradual smooth boundary.
E and Bt—43 to 80 inches; brown (7.5YR 4/4) fine sand; single grain; loose (E); lamellae of brown (7.5YR 4/4) loamy sand $^{1}/_{2}$ to 1 inch thick in layers throughout horizon (Bt); strongly acid.

Range in Characteristics

A or Ap horizon:
Hue—10YR
Value—3 or 4
Chroma—1 to 4
Texture—loamy fine sand or fine sand
Reaction—strongly acid to neutral

E horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—2 to 6
Texture—fine sand or loamy fine sand
Reaction—strongly acid to slightly acid

E and Bt horizon (E part):
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 6
Texture—fine sand or loamy fine sand
Reaction—strongly acid to slightly acid

E and Bt horizon (Bt part):
Hue—7.5YR or 10YR
Value—3 to 5

Chroma—3 to 6
Texture—sandy loam, loamy sand, fine sandy loam, loamy fine sand, or fine sand
Reaction—strongly acid to slightly acid

Clyde Series

Typical Pedon

Clyde silty clay loam, 0 to 3 percent slopes, in a grassed waterway in Bremer County, Iowa; about 355 feet west and 2,430 feet north of the southeast corner of sec. 25, T. 93 N., R. 12 W.; USGS Sumner SW (IA) topographic quadrangle; lat. 42 degrees 50 minutes 22.8 seconds N. and long. 92 degrees 12 minutes 01.4 seconds W.; NAD 83:

A1—0 to 4 inches; black (N 2/) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; neutral; clear smooth boundary.

A2—4 to 17 inches; black (N 2/) clay loam, very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure; friable; neutral; clear smooth boundary.

BA—17 to 24 inches; olive gray (5Y 5/2) clay loam; weak fine and medium subangular blocky structure; friable; common distinct very dark gray (2.5Y 3/1) organic stains on faces of peds; neutral; clear smooth boundary.

Bg1—24 to 31 inches; olive gray (5Y 5/2) clay loam; weak medium subangular blocky structure; friable; few fine prominent black (10YR 2/1) manganese masses; few fine prominent yellowish brown (10YR 5/6) masses of oxidized iron; neutral; gradual smooth boundary.

2Bg2—31 to 39 inches; gray (5Y 6/1) and yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; firm; neutral; abrupt smooth boundary.

2Bg3—39 to 43 inches; olive gray (5Y 4/2) sandy loam; weak coarse subangular blocky structure; friable; neutral; clear smooth boundary.

2BCg1—43 to 68 inches; gray (5Y 6/1), grayish brown (2.5Y 5/2), and yellowish brown (10YR 5/6) loam; weak coarse prismatic structure; firm; neutral; abrupt smooth boundary.

2BCg2—68 to 80 inches; olive gray (5Y 4/2) loam; weak coarse prismatic structure; firm; few fine distinct gray (N 5/) iron-manganese masses; few fine distinct olive brown (2.5Y 4/4) masses of oxidized iron; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 12 to 24 inches
Depth to carbonates: 45 to 70 inches
Depth to lithologic discontinuity: 30 to 60 inches
Other features: Some pedons have thin (less than 6 inches thick) strata of silt loam, sandy loam, or sandy clay loam.
Note: The color of the 2Bg3 horizon is outside the range defined for the series.

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam, clay loam, silt loam, or loam
Content of rock fragments—1 to 5 percent
Reaction—slightly acid or neutral

Bg or 2Bg horizon:
Hue—5Y or 2.5Y in the upper part; 7.5YR to 5Y in the lower part
Value—4 to 6

Chroma—1 or 2 in the upper part; 1 to 8 in the lower part
Texture—clay loam, loam, or silty clay loam
Content of rock fragments—1 to 10 percent; a thin stone line with rock fragments up to 3 inches in diameter is in the lower part of this horizon in some pedons
Reaction—slightly acid or neutral

2BCg or 2BC horizon:
Hue—7.5YR to 5Y
Value—4 to 6
Chroma—1 to 8
Texture—loam
Content of rock fragments—2 to 12 percent
Reaction—slightly acid to moderately alkaline

Coland Series

Typical Pedon

Coland clay loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field in Bremer County, Iowa; about 192 feet north and 1,092 feet west of the southeast corner of sec. 13, T. 93 N., R. 12 W.; USGS Sumner SW (IA) topographic quadrangle; lat. 42 degrees 51 minutes 45.5 seconds N. and long. 92 degrees 12 minutes 10.3 seconds W.; NAD 83:

Ap—0 to 10 inches; black (N 2/) clay loam, very dark grayish brown (10YR 3/2) dry; moderate medium granular structure; friable; many very fine and fine roots; slightly acid; abrupt smooth boundary.
A1—10 to 22 inches; black (N 2/) silty clay loam, very dark grayish brown (10YR 3/2) dry; moderate medium subangular blocky structure; friable; many very fine and fine roots; slightly acid; clear wavy boundary.
A2—22 to 32 inches; black (N 2/) loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; friable; few very fine roots; slightly acid; clear wavy boundary.
AB—32 to 45 inches; very dark gray (5Y 3/1) clay loam; moderate medium subangular blocky structure; friable; few very fine roots; many prominent strong brown (7.5YR 4/6) oxidized iron stains on surfaces along root channels; slightly acid; abrupt smooth boundary.
Bg—45 to 62 inches; gray (5Y 5/1) clay loam; weak coarse subangular blocky structure; firm; many prominent strong brown (7.5YR 4/6) oxidized iron stains on surfaces along root channels; slightly acid; gradual wavy boundary.
Cg—62 to 80 inches; gray (5Y 5/1) loam; massive; firm; common prominent strong brown (7.5YR 4/6) oxidized iron stains along surfaces of root channels; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: More than 36 inches

Ap or A horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam, clay loam, or loam
Reaction—moderately acid to neutral

AB horizon:
Hue—10YR to 5Y or N
Value—2 to 4
Chroma—0 to 2
Texture—clay loam or loam
Reaction—slightly acid or neutral

Bg horizon (where present):
Hue—10YR to 5Y or N
Value—2 to 5
Chroma—0 to 2
Texture—clay loam or loam
Reaction—slightly acid or neutral

Cg horizon:
Hue—10YR to 5Y or N
Value—2 to 6
Chroma—0 to 2
Texture—clay loam, loam, or sandy loam
Reaction—slightly acid to slightly alkaline

Coloma Series

Typical Pedon

Coloma loamy sand, 2 to 5 percent slopes, rarely flooded, in a cultivated field in Bremer County, Iowa; about 1,311 feet east and 82 feet south of the northwest corner of sec. 8, T. 93 N., R. 14 W.; USGS Nashua (IA) topographic quadrangle; lat. 42 degrees 53 minutes 20.9 seconds N. and long. 92 degrees 31 minutes 49.5 seconds W.; NAD 83:

Ap—0 to 5 inches; brown (10YR 4/3) loamy sand, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; neutral; gradual wavy boundary.

Bw1—5 to 20 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; neutral; clear smooth boundary.

Bw2—20 to 28 inches; dark yellowish brown (10YR 4/4) sand; weak medium subangular blocky structure; very friable; slightly acid; gradual wavy boundary.

Bw3—28 to 40 inches; yellowish brown (10YR 5/4) sand; weak medium subangular blocky structure; very friable; few distinct dark grayish brown (10YR 4/2) organic stains on faces of peds; strongly acid; gradual wavy boundary.

E and Bt—40 to 51 inches; about 95 percent dark yellowish brown (10YR 4/6) sand (E); single grain; loose; about 5 percent dark brown (10YR 3/3) sandy loam (Bt) consisting of several wavy and discontinuous lamellae $^1/_8$ inch to $1^1/_2$ inches thick; moderate medium subangular blocky structure; firm; strongly acid; gradual smooth boundary.

C—51 to 80 inches; dark yellowish brown (10YR 4/6) sand; single grain; loose; moderately acid.

Range in Characteristics

Depth to the first lamellae: 20 to 60 inches
Thickness of the lamellae: Less than 6 inches

A horizon:
Hue—7.5YR or 10YR
Value—2 to 4

Chroma—1 to 3
Texture—loamy sand or sand
Reaction—strongly acid to neutral

Ap horizon (in cultivated areas):
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—2 or 3

E horizon (where present):
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—sand or loamy sand
Reaction—strongly acid to neutral

Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 6
Texture—sand, loamy sand, fine sand, or loamy fine sand
Reaction—very strongly acid to neutral

E and Bt horizon (E part):
Hue—5YR, 7.5YR, or 10YR
Value—4 to 7
Chroma—3 to 6
Texture—loamy sand, sandy loam, or sand
Reaction—very strongly acid to neutral

E and Bt horizon (Bt part):
Hue—5YR, 7.5YR, or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—loamy sand or sandy loam
Reaction—very strongly acid to neutral

C horizon:
Hue—5YR, 7.5YR, or 10YR
Value—4 to 7
Chroma—3 to 6
Texture—sand
Reaction—strongly acid to neutral

Copaston Series

Typical Pedon

Copaston loam, 5 to 14 percent slopes, in a hayfield in Bremer County, Iowa, about 3 miles west and 3 miles south of Waverly; 550 feet north and 150 feet west of the southeast corner of sec. 19, T. 91 N., R. 14 W.; USGS Shell Rock (IA) topographic quadrangle; lat. 42 degrees 40 minutes 23.7 seconds N. and long. 92 degrees 32 minutes 13.1 seconds W.; NAD 83:

Ap—0 to 6 inches; very dark gray (10YR 3/1) loam, dark grayish brown (2.5Y 4/2) dry; weak fine subangular blocky structure; very friable; about 1 percent mixed rock fragments; neutral; gradual smooth boundary.

AB—6 to 12 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (2.5Y 4/2) dry; weak fine subangular blocky structure; very friable; about 1 percent mixed rock fragments; moderately acid; clear wavy boundary.
Bw—12 to 18 inches; dark yellowish brown (10YR 4/4) loam; weak fine subangular blocky structure; very friable; few distinct dark brown (10YR 3/3) organic stains on faces of peds; about 2 percent mixed rock fragments; slightly acid; abrupt wavy boundary.
2R—18 inches; limestone bedrock.

Range in Characteristics

Depth to bedrock: 10 to 20 inches
Thickness of the mollic epipedon: 7 to 16 inches
Carbonates: Typically in the lower part in some pedons; none in the upper mantle
Other features: Typically, the boundary between the upper mantle and the bedrock is abrupt, but a thin layer of disintegrated rock or less than 2 inches of discontinuous residuum is at the contact in some pedons.

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam, fine sandy loam, sandy clay loam, loam, silt loam, or clay loam
Reaction—moderately acid to neutral

Bw horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—1 to 4
Texture—sandy loam, fine sandy loam, loam, or clay loam
Reaction—moderately acid to slightly alkaline

Dickinson Series

Typical Pedon

Dickinson fine sandy loam, 2 to 5 percent slopes, in a cultivated field in Bremer County, Iowa; about 2,131 feet east and 628 feet north of the southwest corner of sec. 25, T. 91 N., R. 14 W.; USGS Shell Rock (IA) topographic quadrangle; lat. 42 degrees 39 minutes 30.6 seconds N. and long. 92 degrees 26 minutes 52.6 seconds W.; NAD 83:

Ap—0 to 9 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; common very fine and fine roots; neutral; abrupt smooth boundary.
A1—9 to 15 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very friable; common very fine and fine roots; many distinct very dark brown (10YR 2/2) organic stains; slightly acid; clear smooth boundary.
A2—15 to 20 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; very friable; common very fine and fine roots; many distinct very dark grayish brown (10YR 3/2) organic stains; moderately acid; clear smooth boundary.
Bw1—20 to 31 inches; dark yellowish brown (10YR 3/4) fine sandy loam; weak fine subangular blocky structure; very friable; common very fine roots; many distinct

very dark grayish brown (10YR 3/2) organic stains; moderately acid; gradual smooth boundary.

Bw2—31 to 41 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine subangular blocky structure; very friable; common very fine roots; moderately acid; clear smooth boundary.

BC—41 to 68 inches; yellowish brown (10YR 5/4) loamy sand; weak coarse prismatic structure; very friable; moderately acid; clear smooth boundary.

C—68 to 80 inches; yellowish brown (10YR 5/6) sand; single grain; loose; moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 12 to 20 inches
Depth to carbonates: More than 59 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—fine sandy loam, sandy loam, or loam
Reaction—moderately acid to neutral

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—sandy loam or fine sandy loam
Reaction—strongly acid to slightly acid

BC and C horizons:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—loamy fine sand, loamy sand, fine sand, or sand
Reaction—moderately acid to neutral

Dinsdale Series

Typical Pedon

Dinsdale silty clay loam, 2 to 5 percent slopes, in a cultivated field in Bremer County, Iowa; about 386 feet west and 2,490 feet south of the northeast corner of sec. 29, T. 91 N., R. 12 W.; USGS Readlyn (IA) topographic quadrangle; lat. 42 degrees 39 minutes 51.9 seconds N. and long. 92 degrees 16 minutes 47.7 seconds W.; NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; friable; many fine roots; moderately acid; abrupt smooth boundary.

A—8 to 13 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; common fine roots; strongly acid; gradual smooth boundary.

AB—13 to 20 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 4/3) dry; moderate medium subangular blocky structure; friable; common very fine roots; strongly acid; gradual smooth boundary.

Bt1—20 to 39 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; few very fine roots; few distinct dark brown (10YR 3/3) clay films on all faces of peds; strongly acid; gradual smooth boundary.

2Bt2—39 to 46 inches; yellowish brown (10YR 5/6) sandy clay loam; weak fine subangular blocky structure; friable; common distinct dark brown (10YR 3/3) clay films on faces of peds; common fine prominent gray (10YR 6/1) iron depletions; about 2 percent mixed rock fragments; moderately acid; gradual smooth boundary.

2BC1—46 to 56 inches; yellowish brown (10YR 5/6) loam; weak coarse prismatic structure; firm; common fine prominent gray (10YR 6/1) iron depletions; about 3 percent mixed rock fragments; neutral; gradual smooth boundary.

2BC2—56 to 80 inches; yellowish brown (10YR 5/6) loam; weak coarse prismatic structure; firm; common fine prominent gray (10YR 6/1) iron depletions; about 3 percent mixed rock fragments; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to till: 20 to 40 inches
Depth to carbonates: 45 to 60 inches

Ap, A, and AB horizons:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam or silty clay loam
Reaction—strongly acid to neutral

Bt horizon:
Hue—10YR
Value—3 to 5
Chroma—3 to 6
Texture—silty clay loam
Reaction—strongly acid to neutral
Content of rock fragments—1 to 10 percent; a stone line commonly is at the lower boundary of this horizon

2Bt horizon (where present):
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—3 to 8
Texture—loam, sandy clay loam, or clay loam
Reaction—moderately acid to neutral
Content of rock fragments—2 to 15 percent

2BC horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—4 to 8
Texture—loam, sandy clay loam, or clay loam
Reaction—slightly acid to moderately alkaline
Content of rock fragments—2 to 12 percent

Flagler Series

Typical Pedon

Flagler sandy loam, 1 to 4 percent slopes, rarely flooded, in a cultivated field in Bremer County, Iowa; about 824 feet east and 576 feet north of the southwest corner of sec. 20, T. 93 N., R. 14 W.; USGS Plainfield (IA) topographic quadrangle; lat. 42 degrees 50 minutes 56.6 seconds N. and long. 92 degrees 31 minutes 55 seconds W.; NAD 83:

Ap—0 to 11 inches; black (10YR 2/1) sandy loam, very dark brown (10YR 2/2) dry; weak very fine granular structure; friable; common very fine and fine roots; neutral; abrupt smooth boundary.

A1—11 to 20 inches; very dark grayish brown (10YR 3/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure parting to weak very fine granular; friable; common very fine and fine roots; slightly acid; gradual smooth boundary.

A2—20 to 23 inches; very dark grayish brown (10YR 3/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure parting to weak very fine granular; friable; common very fine and fine roots; slightly acid; gradual smooth boundary.

Bw—23 to 39 inches; dark brown (10YR 4/3) sandy loam; weak coarse subangular blocky structure parting to moderate fine granular; very friable; common very fine roots; about 3 percent mixed rock fragments; moderately acid; abrupt wavy boundary.

2C—39 to 80 inches; dark yellowish brown (10YR 4/4) loamy sand; single grain; loose; about 12 percent mixed rock fragments; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 12 to 24 inches
Depth to loamy sand, gravelly sand, gravelly loamy sand, fine sand, or sand: Typically 20 to 40 inches but varies considerably within short distances
Depth to carbonates: More than 72 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam or fine sandy loam
Reaction—moderately acid to neutral

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—sandy loam
Reaction—strongly acid to slightly acid

2C horizon:
Hue—10YR
Value—4 to 6
Chroma—4 to 6
Texture—loamy sand or sand
Content of gravel—5 to 15 percent; as much as 50 percent in some strata
Reaction—strongly acid to neutral

Floyd Series

Typical Pedon

Floyd loam, 1 to 4 percent slopes, in a hayfield in Bremer County, Iowa; about 97 feet north and 266 feet west of the southeast corner of sec. 14, T. 92 N., R. 13 W.; USGS Tripoli (IA) topographic quadrangle; lat. 42 degrees 46 minutes 26.3 seconds N. and long. 92 degrees 20 minutes 18.3 seconds W.; NAD 83:

A1—0 to 16 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; many roots; neutral; gradual smooth boundary.

A2—16 to 24 inches; very dark grayish brown (2.5Y 3/2) loam, grayish brown (2.5Y 5/2) dry; weak fine subangular blocky structure; friable; few roots; very dark gray (10YR 3/1) coatings on peds; neutral; gradual smooth boundary.

Bw1—24 to 33 inches; olive brown (2.5Y 4/4) sandy clay loam; weak fine subangular blocky structure; friable; few roots; common fine distinct dark grayish brown (2.5Y 4/2) redoximorphic depletions; few fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations in the lower part; a stone line (pebbles $^1/_2$ inch to $1^1/_2$ inches in diameter) at a depth of 31 inches; neutral; clear smooth boundary.

Bw2—33 to 41 inches; yellowish brown (10YR 5/8) sandy loam; weak medium subangular blocky structure; very friable; neutral; few stones and pebbles; clear smooth boundary.

2Bw3—41 to 50 inches; yellowish brown (10YR 5/8) loam; weak medium subangular blocky structure; firm; common grayish brown (2.5Y 5/2) coatings on faces of peds; many fine prominent light olive brown (2.5Y 5/4) redoximorphic concentrations; few stones and pebbles; neutral; clear wavy boundary.

2BC—50 to 80 inches; yellowish brown (10YR 5/6) loam; weak very coarse subangular blocky structure dissected by few oblique fractures; firm; common fine prominent grayish brown (2.5Y 5/2) redoximorphic depletions; few pebbles; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 24 inches
Depth to carbonates: 45 to 75 inches
Other features: A stone line is common in the Bw horizon. Also, some pedons have vertical seams or pockets of sand 2 to 5 inches wide beginning in the 2Bw horizon and extending into the 2BC horizon.

Ap or A1 horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—loam, clay loam, silty clay loam, or silt loam
Reaction—slightly acid or neutral

A2 horizon:
Hue—10YR or 2.5Y
Value—3
Chroma—1 or 2
Texture—loam, clay loam, or silty clay loam that is high in content of sand
Reaction—slightly acid or neutral

Bw horizon (upper part):
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 where hue is 10YR; 2 to 4 where hue is 2.5Y
Texture—loam or sandy clay loam

Reaction—slightly acid or neutral
Content of rock fragments—1 to 10 percent

Bw horizon (lower part):
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 8
Texture—sandy loam, loam, or sandy clay loam; thin strata of loamy sand in some pedons
Reaction—slightly acid or neutral
Content of rock fragments—1 to 10 percent

2Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 8
Texture—loam, clay loam, or sandy clay loam
Reaction—slightly acid to moderately alkaline
Content of rock fragments—2 to 12 percent

2BC or 2C horizon (where present):
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—1 to 8
Texture—loam, clay loam, or sandy clay loam
Reaction—slightly acid to moderately alkaline
Content of rock fragments—2 to 12 percent

Fort Dodge Series

Typical Pedon

Fort Dodge loam, 1 to 4 percent slopes, in a cultivated field in Bremer County, Iowa; about 609 feet west and 272 feet south of the northeast corner of sec. 21, T. 91 N., R. 14 W.; USGS Waverly (IA) topographic quadrangle; lat. 42 degrees 41 minutes 06.8 seconds N. and long. 92 degrees 29 minutes 51 seconds W.; NAD 83:

Ap—0 to 9 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure parting to moderate fine granular; friable; many very fine and fine roots; slightly acid; abrupt smooth boundary.
A1—9 to 18 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; friable; many very fine and fine roots; slightly acid; clear wavy boundary.
A2—18 to 27 inches; very dark brown (10YR 2/2) loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; friable; many very fine and fine roots; slightly acid; clear wavy boundary.
AB—27 to 39 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; friable; many very fine and fine roots; slightly acid; abrupt smooth boundary.
Bw—39 to 52 inches; dark yellowish brown (10YR 4/4) loam; weak fine and medium subangular blocky structure; friable; few very fine roots; slightly acid; abrupt smooth boundary.
2C—52 to 80 inches; yellowish brown (10YR 5/6) loamy coarse sand; single grain; loose; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 55 inches
Depth to carbonates: More than 40 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam
Reaction—slightly acid or neutral

AB or BA horizon (where present):
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loam or clay loam
Reaction—slightly acid or neutral

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—3 to 6
Texture—loam or sandy loam
Reaction—slightly acid or neutral

2C horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—3 to 8
Texture—sand, coarse sand, loamy sand, or loamy coarse sand or the gravelly analogs of these textures
Reaction—slightly acid to moderately alkaline

Hayfield Series

Typical Pedon

Hayfield loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field in Bremer County, Iowa; about 135 feet north and 2,582 feet east of the southwest corner of sec. 29, T. 91 N., R. 11 W.; USGS Readlyn (IA) topographic quadrangle; lat. 42 degrees 39 minutes 25.4 seconds N. and long. 92 degrees 10 minutes 13.6 seconds W.; NAD 83:

Ap—0 to 9 inches; black (10YR 2/1) loam, dark grayish brown (10YR 4/2) dry; weak very fine subangular blocky structure; friable; common very fine and fine roots; slightly acid; abrupt smooth boundary.

E—9 to 12 inches; dark grayish brown (10YR 4/2) silt loam, brown (10YR 5/3) dry; weak medium platy structure; friable; common very fine and fine roots; common distinct very dark grayish brown (10YR 3/2) organic stains; few distinct dark yellowish brown (10YR 4/4) masses of oxidized iron; moderately acid; abrupt smooth boundary.

Bt1—12 to 23 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium subangular blocky structure; friable; common very fine roots; few distinct grayish brown (10YR 5/2) clay films; few medium faint light olive brown (2.5Y 5/4) redoximorphic concentrations; few fine distinct grayish brown (10YR 5/2) redoximorphic depletions; moderately acid; clear wavy boundary.

Bt2—23 to 33 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; friable; common very fine roots; few distinct grayish brown (10YR 5/2) clay films; many medium distinct grayish brown (10YR 5/2) redoximorphic depletions; moderately acid; abrupt smooth boundary.

2C—33 to 80 inches; dark yellowish brown (10YR 4/6) sand; single grain; loose; common medium faint yellowish brown (10YR 5/6) redoximorphic concentrations; common medium prominent grayish brown (10YR 5/2) redoximorphic depletions; slightly acid.

Range in Characteristics

Depth to sand and gravel: 20 to 40 inches
Depth to carbonates: More than 40 inches
Other features: In some pedons in cultivated areas, the E horizon is mixed in with the Ap horizon.

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam or silt loam
Reaction—moderately acid or slightly acid

E horizon:
Hue—10YR
Value—4 or 5
Chroma—1 or 2
Texture—loam or silt loam
Reaction—moderately acid or slightly acid

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—loam, silt loam, silty clay loam, or sandy clay loam
Reaction—strongly acid to slightly acid

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—sand, coarse sand, loamy coarse sand, or loamy sand or the gravelly analogs of these textures
Reaction—moderately acid to slightly alkaline

Hoopeston Series

Typical Pedon

Hoopeston sandy loam, terrace, 0 to 2 percent slopes, rarely flooded, in a cultivated field in Bremer County, Iowa; about 1,420 feet north and 1,250 feet east of the southwest corner of sec. 18, T. 92 N., R. 11 W.; USGS Sumner SW (IA) topographic quadrangle; lat. 42 degrees 46 minutes 37.2 seconds N. and long. 92 degrees 11 minutes 39.4 seconds W.; NAD 83:

Ap—0 to 11 inches; black (10YR 2/1) sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

A—11 to 19 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; very friable; slightly acid; gradual smooth boundary.
Bw—19 to 26 inches; brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; friable; few distinct dark brown (10YR 3/3) organic stains on all faces of peds; common coarse prominent strong brown (7.5YR 4/6) masses of oxidized iron; common coarse faint dark grayish brown (10YR 4/2) iron depletions; neutral; clear smooth boundary.
Bg—26 to 38 inches; grayish brown (10YR 5/2) sandy loam; weak coarse subangular blocky structure; friable; many very coarse prominent strong brown (7.5YR 4/6) masses of oxidized iron; many very coarse faint gray (10YR 5/1) iron depletions; slightly acid; clear wavy boundary.
Cg1—38 to 68 inches; grayish brown (10YR 5/2) and brown (10YR 4/3) sand; single grain; loose; common fine faint dark grayish brown (10YR 4/2) iron depletions; common fine prominent yellowish brown (10YR 5/6) masses of oxidized iron; neutral; clear wavy boundary.
Cg2—68 to 80 inches; light brownish gray (10YR 6/2) and brown (10YR 5/3) sand; single grain; loose; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Depth to carbonates: More than 40 inches

Ap or A horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam, fine sandy loam, or loam
Reaction—strongly acid to slightly acid

Bw or Bg horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—1 to 6
Texture—fine sandy loam or sandy loam
Reaction—strongly acid to slightly alkaline

C or Cg horizon:
Hue—7.5YR to 5Y
Value—3 to 6
Chroma—1 to 8
Texture—loamy fine sand, loamy sand, fine sand, or sand
Reaction—very strongly acid to moderately alkaline

Joy Series

Typical Pedon

Joy silt loam, in a nearly level area in a cultivated field in Henry County, Illinois, about 4 miles northeast of Geneseo; 1,980 feet east and 2,600 feet north of the southwest corner of sec. 26, T. 18 N., R. 3 E.; USGS Spring Hill topographic quadrangle; lat. 41 degrees 31 minutes 10 seconds N. and long. 90 degrees 07 minutes 00 seconds W.; NAD 27:

Ap—0 to 5 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; moderately acid; abrupt smooth boundary.

A1—5 to 13 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to moderate medium granular; friable; slightly acid; clear smooth boundary.

A2—13 to 17 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure parting to moderate medium granular; friable; neutral; clear smooth boundary.

Bt1—17 to 21 inches; brown (10YR 4/3) and very dark grayish brown (10YR 3/2) silt loam; moderate fine and medium subangular blocky structure; friable; common faint dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear smooth boundary.

Bt2—21 to 27 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) silty clay loam; moderate fine and medium subangular blocky structure; friable; common faint dark grayish brown (10YR 4/2) clay films on faces of peds; common medium prominent yellowish brown (10YR 5/6) iron masses within the matrix; common black (7.5YR 2.5/1) iron and manganese oxides on faces of peds; neutral; clear smooth boundary.

Bt3—27 to 34 inches; yellowish brown (10YR 5/4) silt loam; moderate fine and medium subangular blocky structure; friable; common faint brown (10YR 5/3) clay films on faces of peds; common fine distinct light brownish gray (10YR 6/2) iron depletions within the matrix; common fine faint yellowish brown (10YR 5/6) iron masses within the matrix; common black (7.5YR 2.5/1) iron and manganese oxides on faces of peds; neutral; clear smooth boundary.

Btg—34 to 49 inches; mottled light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) silt loam; weak fine prismatic structure parting to weak fine and medium subangular blocky; friable; few faint grayish brown (10YR 5/2) clay films on faces of peds; common black (7.5YR 2.5/1) iron and manganese oxides on faces of peds; neutral; gradual smooth boundary.

Cg—49 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; massive; friable; many medium prominent yellowish brown (10YR 5/6) iron masses within the matrix; common black (7.5YR 2.5/1) iron and manganese oxides along cleavage planes; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: More than 40 inches
Other features: Some pedons have an AB or BA horizon. Also, some pedons have a Bg horizon, and some have a BC horizon.

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam
Reaction—moderately acid to neutral

Bt or Bw horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—silt loam or silty clay loam
Reaction—strongly acid to neutral

Cg or C horizon:
Hue—10YR to 5Y
Value—4 to 7
Chroma—1 to 4
Texture—silt loam, very fine sandy loam, or loam
Reaction—slightly acid to moderately alkaline

Kasson Series

Typical Pedon

Kasson loam, 5 to 9 percent slopes, in a cultivated field in Bremer County, Iowa; about 1,945 feet west and 224 feet south of the northeast corner of sec. 14, T. 92 N., R. 12 W.; USGS Sumner SW (IA) topographic quadrangle; lat. 42 degrees 47 minutes 13.3 seconds N. and long. 92 degrees 13 minutes 34.2 seconds W.; NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; common fine and medium roots; slightly acid; abrupt smooth boundary.

BE—8 to 12 inches; brown (10YR 4/3) loam; moderate medium subangular blocky structure; friable; common fine roots; moderately acid; clear wavy boundary.

Bt1—12 to 20 inches; dark yellowish brown (10YR 4/4) loam; strong medium subangular blocky structure; friable; common very fine and fine roots; common distinct brown (10YR 4/3) clay films on faces of peds; moderately acid; abrupt wavy boundary.

2Bt2—20 to 30 inches; brown (10YR 5/3) clay loam; moderate medium subangular blocky structure; friable; few very fine and fine roots; common distinct brown (10YR 4/3) clay films on faces of peds; few medium distinct dark yellowish brown (10YR 4/6) redoximorphic concentrations; strongly acid; clear wavy boundary.

2Bt3—30 to 41 inches; brown (10YR 5/3) clay loam; moderate medium subangular blocky structure; friable; few very fine and fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; common medium distinct dark yellowish brown (10YR 4/6) redoximorphic concentrations; common medium distinct gray (10YR 5/1) redoximorphic depletions; strongly acid; clear wavy boundary.

2BC1—41 to 55 inches; yellowish brown (10YR 5/4) loam; moderate coarse prismatic structure parting to weak medium subangular blocky; firm; few medium distinct dark yellowish brown (10YR 4/6) redoximorphic concentrations; common medium distinct gray (10YR 5/1) redoximorphic depletions; slightly acid; clear wavy boundary.

2BC2—55 to 80 inches; yellowish brown (10YR 5/4) loam; moderate coarse prismatic structure; firm; common prominent white (10YR 8/1) carbonate concretions; few medium distinct dark yellowish brown (10YR 4/6) redoximorphic concentrations; common medium distinct gray (10YR 5/1) redoximorphic depletions; slightly acid.

Range in Characteristics

Depth to carbonates: More than 40 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loam or silt loam
Reaction—moderately acid to neutral

E horizon (where present):
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—loam or silt loam
Reaction—strongly acid to neutral

BE or EB horizon (where present):
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—loam or silt loam
Reaction—strongly acid to neutral

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam, silty clay loam, or loam
Reaction—very strongly acid to moderately acid

2Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 to 6
Texture—loam or clay loam
Reaction—very strongly acid to neutral

2BC horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—4 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline

Kenyon Series

Typical Pedon

Kenyon loam, 2 to 5 percent slopes, in a cultivated field in Bremer County, Iowa; about 960 feet north and 1,710 feet east of the southwest corner of sec. 16, T. 93 N., R. 11 W.; USGS Sumner SW (IA) topographic quadrangle; lat. 42 degrees 51 minutes 52.4 seconds N. and long. 92 degrees 09 minutes 15.2 seconds W.; NAD 83:

Ap—0 to 9 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common fine roots; moderately acid; clear smooth boundary.

A—9 to 14 inches; very dark brown (10YR 2/2) loam, very dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; common fine roots; moderately acid; clear smooth boundary.

AB—14 to 19 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; common very fine roots; strongly acid; clear smooth boundary.

2Bw1—19 to 41 inches; yellowish brown (10YR 5/6) loam; weak fine subangular blocky structure; friable; common very fine roots; about 2 percent mixed rock fragments; strongly acid; gradual smooth boundary.

2Bw2—41 to 55 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure; firm; about 2 percent mixed rock fragments; strongly acid; gradual smooth boundary.

2BC1—55 to 71 inches; yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; firm; common medium distinct brownish yellow (10YR 6/8) redoximorphic concentrations; common medium prominent gray (10YR 6/1) redoximorphic depletions; about 2 percent mixed rock fragments; slightly acid; gradual smooth boundary.

2BC2—71 to 80 inches; yellowish brown (10YR 5/6) loam; weak very coarse subangular blocky structure; firm; common medium distinct brownish yellow (10YR 6/8) redoximorphic concentrations; common medium prominent gray (10YR 6/1) redoximorphic depletions; about 2 percent mixed rock fragments; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: 45 to 80 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam or silt loam
Reaction—strongly acid to neutral

AB or BA horizon:
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—loam, silt loam, or sandy clay loam
Reaction—strongly acid to slightly acid

Bw horizon (where present):
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 6
Texture—loam, silt loam, clay loam, or sandy clay loam
Reaction—slightly acid or neutral

2Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 6
Texture—loam, clay loam, or sandy clay loam
Reaction—strongly acid or moderately acid

2BC or 2C horizon:
Hue—7.5YR to 5Y
Value—4 to 8
Chroma—1 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline

Klinger Series

Typical Pedon

Klinger silty clay loam, 1 to 3 percent slopes, in a cultivated field in Bremer County, Iowa; about 333 feet west and 1,389 feet north of the southeast corner of sec. 26, T. 91 N., R. 12 W.; USGS Readlyn (IA) topographic quadrangle; lat. 42 degrees 39 minutes 36.5 seconds N. and long. 92 degrees 13 minutes 14 seconds W.; NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; many fine and medium roots; moderately acid; abrupt smooth boundary.

A—8 to 14 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; many fine and medium roots; moderately acid; clear smooth boundary.

AB—14 to 19 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; many fine and medium roots; moderately acid; clear smooth boundary.

Bg1—19 to 29 inches; olive brown (2.5Y 4/3) silty clay loam; weak fine subangular blocky structure; friable; common fine roots; common fine prominent yellowish brown (10YR 5/6) iron masses; slightly acid; gradual smooth boundary.

2Bg2—29 to 45 inches; light olive brown (2.5Y 5/4) loam; weak fine subangular blocky structure; firm; common fine distinct yellowish brown (10YR 5/6) iron masses; common medium prominent gray (10YR 5/1) iron depletions; slightly acid; gradual smooth boundary.

2Bg3—45 to 59 inches; light olive brown (2.5Y 5/6) loam; weak medium subangular blocky structure; firm; common fine faint yellowish brown (10YR 5/6) iron masses; common medium prominent gray (10YR 5/1) iron depletions; slightly acid; gradual smooth boundary.

2BC1—59 to 72 inches; light yellowish brown (2.5Y 6/3) loam; weak coarse subangular blocky structure; firm; common medium distinct gray (10YR 5/1) iron depletions; common fine prominent yellowish brown (10YR 5/6) iron masses; slightly alkaline; gradual smooth boundary.

2BC2—72 to 80 inches; light yellowish brown (2.5Y 6/4) loam; weak coarse subangular blocky structure; firm; common fine distinct yellowish brown (10YR 5/6) iron masses; common medium distinct grayish brown (10YR 5/2) iron depletions; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 14 to 20 inches
Depth to till: 20 to 40 inches
Depth to carbonates: More than 45 inches
Other features: Some pedons have thin layers of sandy loam, sandy clay loam, or loamy sand between the loess and the till.

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—strongly acid to neutral

AB horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2

Texture—silt loam or silty clay loam
Reaction—strongly acid to neutral

Bg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silty clay loam
Reaction—strongly acid to slightly acid

2Bg horizon and 2BCg horizon (where present):
Hue—2.5Y
Value—5 or 6
Chroma—2 to 6
Texture—loam or clay loam
Reaction—strongly acid to slightly alkaline
Content of rock fragments—2 to 12 percent

2BC horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 6
Texture—loam
Reaction—slightly acid to moderately alkaline
Content of rock fragments—2 to 12 percent

Klingmore Series

Typical Pedon

Klingmore silty clay loam, 1 to 3 percent slopes, in a cultivated field in Bremer County, Iowa; about 70 feet east and 2,280 feet north of the southwest corner of sec. 29, T. 91 N., R. 12 W.; USGS Denver (IA) topographic quadrangle; lat. 42 degrees 39 minutes 47.3 seconds N. and long. 92 degrees 17 minutes 51.5 seconds W.; NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (2.5Y 3/1) dry; weak fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.
A1—8 to 13 inches; black (10YR 2/1) silty clay loam, dark gray (2.5Y 4/1) dry; moderate medium subangular blocky structure; friable; moderately acid; clear smooth boundary.
A2—13 to 19 inches; very dark gray (10YR 3/1) silty clay loam, gray (5Y 5/1) dry; moderate medium subangular blocky structure; friable; moderately acid; clear smooth boundary.
Btg1—19 to 26 inches; grayish brown (2.5Y 5/2) silty clay loam; weak fine subangular blocky structure; friable; moderately acid; clear wavy boundary.
Btg2—26 to 39 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate fine subangular blocky structure; friable; few fine spherical black (N 2/) manganese masses in the matrix; few medium prominent yellowish brown (10YR 5/6) masses of oxidized iron; strongly acid; gradual wavy boundary.
Btg3—39 to 54 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium subangular blocky structure; friable; few fine spherical black (N 2/) manganese masses in the matrix; common medium prominent yellowish brown (10YR 5/6) masses of oxidized iron; moderately acid; gradual wavy boundary.

2BC—54 to 80 inches; light olive brown (2.5Y 5/3) and yellowish brown (10YR 5/6) loam; strong coarse subangular blocky structure; firm; about 5 percent angular mixed rock fragments; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 14 to 20 inches
Depth to till: 40 to 60 inches
Depth to carbonates: More than 40 inches
Other features: Some pedons have a stone line or thin layer (1 to 5 inches thick) of gravelly and sandy materials at the base of the loess.

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silty clay loam or silt loam
Reaction—strongly acid to neutral

Btg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam
Reaction—strongly acid to neutral

2Btg and 2BCg horizons (where present):
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—1 to 8
Texture—loam, clay loam, or sandy clay loam
Reaction—strongly acid to neutral
Content of rock fragments—2 to 12 percent

2BC horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—1 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline
Content of rock fragments—2 to 12 percent

Klossner Series

Typical Pedon

Klossner muck, 1 to 3 percent slopes, in an area of wetland vegetation in Black Hawk County, Iowa; about 1,900 feet north and 1,650 feet west of the southeast corner of sec. 15, T. 87 N., R. 13 W.; USGS Eagle Center (IA) topographic quadrangle; lat. 42 degrees 20 minutes 46.4 seconds N. and long. 92 degrees 20 minutes 38.6 seconds W.; NAD 83:

Oa1—0 to 6 inches; black (N 2/) muck; weak fine subangular blocky structure; very friable; many very fine and fine roots; slightly acid; clear smooth boundary.
Oa2—6 to 24 inches; black (N 2/) muck; weak fine subangular blocky structure; very friable; many very fine and fine roots; moderately acid; clear smooth boundary.
2A1—24 to 32 inches; black (N 2/) mucky silt loam; weak fine subangular blocky structure; very friable; common very fine roots; neutral; gradual smooth boundary.

2A2—32 to 41 inches; black (N 2/) mucky silt loam; weak fine subangular blocky structure; very friable; few very fine roots; slightly alkaline; clear smooth boundary.
2A3—41 to 49 inches; black (N 2/) mucky silt loam; massive; very friable; few medium prominent greenish gray (5GY 6/1) redoximorphic depletions; slightly alkaline; clear smooth boundary.
2Cg—49 to 80 inches; greenish gray (5GY 6/1) silt loam; massive; friable; slightly alkaline.

Range in Characteristics

Thickness of the organic material: 16 to 50 inches

O horizon:
Hue—5YR, 10YR, or N
Value—2 or 3
Chroma—0 to 2
Texture—muck

2A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—2 or 3
Chroma—0 or 1
Texture—loam, silt loam, sandy clay loam, or silty clay loam or the mucky analogs of these textures

2Cg horizon:
Hue—10YR, 2.5Y, 5Y, 5GY, or N
Value—2 to 7
Chroma—0 to 2
Texture—loam, silt loam, silty clay loam, clay loam, sandy clay loam, sandy loam, or fine sandy loam or the gravelly or cobbly analogs of these textures

Lawler Series

Typical Pedon

Lawler loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field in Bremer County, Iowa; about 1,650 feet south and 100 feet east of the northwest corner of sec. 4, T. 91 N., R. 13 W.; USGS Waverly (IA) topographic quadrangle; lat. 42 degrees 43 minutes 38.6 seconds N. and long. 92 degrees 22 minutes 37.1 seconds W.; NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure parting to weak fine granular; friable; moderately acid; clear smooth boundary.
A—8 to 15 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; moderately acid; gradual smooth boundary.
AB—15 to 21 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; very dark gray (10YR 3/1) organic stains on all faces of peds; moderately acid; gradual smooth boundary.
Bg1—21 to 27 inches; dark grayish brown (2.5Y 4/2) loam; weak medium subangular blocky structure; friable; very dark grayish brown (2.5Y 3/2) organic stains on all faces of peds; few fine prominent yellowish red (5YR 4/6), common fine prominent yellowish brown (10YR 5/6), and common fine distinct olive brown (2.5Y 4/4) masses of oxidized iron; moderately acid; gradual smooth boundary.

Bg2—27 to 32 inches; dark grayish brown (2.5Y 4/2), grayish brown (2.5Y 5/2), and yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; friable; few fine prominent light olive brown (2.5Y 5/6) and brown (7.5YR 4/4) masses of oxidized iron; slightly acid; clear wavy boundary.

BC—32 to 37 inches; yellowish brown (10YR 5/6), light olive brown (2.5Y 5/6), and grayish brown (2.5Y 5/2) sandy clay loam; weak coarse subangular blocky structure; friable; slightly acid; clear smooth boundary.

2C1—37 to 45 inches; dark grayish brown (10YR 4/2) very gravelly loamy sand; single grain; loose; about 40 percent subrounded mixed rock fragments; slightly acid; clear smooth boundary.

2C2—45 to 57 inches; brown (10YR 4/3) very gravelly loamy sand; single grain; loose; about 40 percent subrounded mixed rock fragments; slightly acid; clear wavy boundary.

2C3—57 to 80 inches; brown (10YR 4/3) coarse sand; single grain; loose; slightly acid.

Range in Characteristics

Depth to sand and gravel: 24 to 40 inches
Depth to carbonates: More than 48 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam, silt loam containing noticeable sand, or clay loam
Reaction—moderately acid to neutral

AB or BA horizon:
Hue—10YR
Value—3
Chroma—1 or 2
Texture—loam or clay loam
Reaction—moderately acid to neutral

Bg, Bw, or BC horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—2 to 6
Texture—loam, clay loam, sandy clay loam, or silt loam
Reaction—strongly acid to slightly acid

2BC horizon (where present):
Hue—7.5YR to 2.5Y
Value—4 to 8
Chroma—1 to 6
Texture—loamy coarse sand to gravelly loamy sand; thin layers of sandy loam in some pedons
Reaction—strongly acid to neutral

2C horizon:
Hue—7.5YR to 2.5Y
Value—4 to 8
Chroma—1 to 6
Texture—loamy coarse sand, loamy sand, coarse sand, or sand or the gravelly or very gravelly analogs of these textures
Reaction—strongly acid to neutral
Content of gravel—0 to 50 percent

Marquis Series

Typical Pedon

Marquis loam, 2 to 5 percent slopes, in a cultivated field in Bremer County, Iowa; about 1,585 feet north and 1,445 feet west of the southeast corner of sec. 7, T. 91 N., R. 12 W.; USGS Denver (IA) topographic quadrangle; lat. 42 degrees 42 minutes 17.5 seconds N. and long. 92 degrees 18 minutes 11.7 seconds W.; NAD 83:

Ap—0 to 9 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate very thin platy structure parting to moderate fine granular; friable; common fine roots; neutral; abrupt smooth boundary.

A—9 to 18 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; friable; common very fine roots; many distinct black (10YR 2/1) organic stains on all faces of peds; neutral; clear smooth boundary.

Bw1—18 to 24 inches; brown (10YR 4/3) loam; moderate fine subangular blocky structure; friable; common very fine roots; common distinct very dark brown (10YR 2/2) organic stains on all faces of peds; slightly acid; clear smooth boundary.

2Bw2—24 to 34 inches; yellowish brown (10YR 5/6) loam; moderate fine and medium subangular blocky structure; firm; common very fine roots; few distinct yellowish brown (10YR 4/3) organic stains on all faces of peds; about 2 percent mixed rock fragments; slightly acid; gradual smooth boundary.

2Bw3—34 to 52 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; firm; common very fine roots; common medium distinct brownish yellow (10YR 6/8) redoximorphic concentrations; common medium prominent grayish brown (2.5Y 5/2) redoximorphic depletions; about 5 percent mixed rock fragments; slightly acid; clear smooth boundary.

2BC—52 to 80 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; firm; few medium prominent light gray (10YR 7/2) carbonate masses; common coarse prominent brownish yellow (10YR 6/8) redoximorphic concentrations; common medium distinct coarse gray (10YR 5/1) redoximorphic depletions; about 5 percent mixed rock fragments; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 12 to 20 inches
Depth to carbonates: More than 45 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loam or silt loam
Reaction—slightly acid or neutral

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 6
Texture—loam, silt loam, clay loam, or sandy clay loam
Reaction—slightly acid or neutral

2Bw horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—1 to 8

Texture—loam
Reaction—strongly acid to neutral

2BC horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—1 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline

Marshan Series

Typical Pedon

Marshan clay loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field in Bremer County, Iowa; about 1,444 feet south and 320 feet west of the northeast corner of sec. 18, T. 92 N., R. 11 W.; USGS Sumner SW (IA) topographic quadrangle; lat. 42 degrees 47 minutes 01.7 seconds N. and long. 92 degrees 10 minutes 53.6 seconds W.; NAD 83:

Ap—0 to 10 inches; black (N 2/) clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; many very fine and fine roots; neutral; abrupt wavy boundary.
A—10 to 16 inches; black (N 2/) clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; many very fine and fine roots; neutral; clear wavy boundary.
AB—16 to 23 inches; black (2.5Y 2.5/1) clay loam, dark grayish brown (2.5Y 4/2) dry; weak fine subangular blocky structure; friable; many very fine and fine roots; neutral; clear wavy boundary.
Bg1—23 to 34 inches; dark gray (5Y 4/1) clay loam; weak fine subangular blocky structure; friable; few very fine roots; neutral; clear wavy boundary.
Bg2—34 to 39 inches; olive gray (5Y 5/2) loam; moderate fine subangular blocky structure; friable; many fine prominent yellowish brown (10YR 5/6) iron masses; slightly acid; abrupt smooth boundary.
2C—39 to 80 inches; yellowish brown (10YR 5/4) gravelly sand; single grain; loose; about 20 percent mixed rock fragments; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 12 to 24 inches
Depth to sand and gravel: 24 to 40 inches
Depth to carbonates: More than 40 inches

Ap or A horizon:
Hue—10YR to 5Y or N
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam, clay loam, or loam
Reaction—moderately acid to neutral

Bg horizon:
Hue—5Y or 2.5Y
Value—4 or 5
Chroma—1 or 2
Texture—clay loam or loam
Reaction—moderately acid to neutral

2C or 2Cg horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—1 to 6
Texture—sand, loamy sand, gravelly sand, or gravelly loamy sand
Reaction—neutral or slightly acid

Maxfield Series

Typical Pedon

Maxfield silty clay loam, 0 to 2 percent slopes, in a cultivated field in Bremer County, Iowa; about 170 feet east and 293 feet north of the southwest corner of sec. 24, T. 91 N., R. 12 W.; USGS Readlyn (IA) topographic quadrangle; lat. 42 degrees 40 minutes 18 seconds N. and long. 92 degrees 13 minutes 07.2 seconds W.; NAD 83:

Ap—0 to 12 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; many fine and medium roots; neutral; gradual smooth boundary.

A—12 to 19 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; many fine roots; common fine distinct gray (10YR 5/1) iron depletions; neutral; abrupt smooth boundary.

Bg—19 to 29 inches; dark grayish brown (2.5Y 4/2) silty clay loam; weak medium subangular blocky structure; friable; common fine roots; common distinct dark gray (10YR 4/1) clay films on faces of peds; common fine prominent strong brown (7.5YR 5/6) iron masses; neutral; gradual smooth boundary.

2Bw1—29 to 47 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; firm; common fine distinct strong brown (7.5YR 5/6) iron masses; common fine distinct grayish brown (2.5Y 5/2) iron depletions; about 2 percent rock fragments; neutral; gradual smooth boundary.

2Bw2—47 to 55 inches; yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; firm; common fine faint strong brown (7.5YR 5/6) iron masses; common fine prominent grayish brown (2.5Y 5/2) iron depletions; about 2 percent rock fragments; neutral; gradual smooth boundary.

2BC1—55 to 70 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; firm; common medium distinct strong brown (7.5YR 5/6) iron masses; common medium prominent gray (2.5Y 6/1) iron depletions; about 2 percent rock fragments; slightly effervescent; slightly alkaline; gradual smooth boundary.

2BC2—70 to 80 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; firm; many medium prominent gray (2.5Y 6/1) iron depletions; about 2 percent rock fragments; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 14 to 24 inches
Depth to till: 24 to 40 inches
Depth to carbonates: 40 to 60 inches
Other features: In most pedons, a stone line or a thin sandy lens is at the contact between the loess and the till.

A or Ap horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1

Texture—silty clay loam or silt loam
Reaction—strongly acid to neutral

Bg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay loam or silt loam
Reaction—moderately acid to neutral

2Bw horizon:
Hue—10YR or 7.5YR
Value—5
Chroma—4 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline

2BC or 2C horizon (where present):
Hue—7.5YR to 5Y
Value—4 to 6
Chroma—1 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline

Maxmore Series

Typical Pedon

Maxmore silty clay loam, 0 to 2 percent slopes, in a cultivated field in Bremer County, Iowa; about 150 feet west and 740 feet south of the northeast corner of sec. 30, T. 91 N., R. 12 W.; USGS Denver (IA) topographic quadrangle; lat. 42 degrees 40 minutes 09.9 seconds N. and long. 92 degrees 17 minutes 55.3 seconds W.; NAD 83:

Ap—0 to 5 inches; black (N 2/) silty clay loam, black (10YR 2/1) dry; moderate fine subangular blocky structure; firm; neutral; clear smooth boundary.

A—5 to 18 inches; black (N 2/) silty clay loam, black (10YR 2/1) dry; moderate medium subangular blocky structure; firm; neutral; clear wavy boundary.

BAg—18 to 24 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate fine subangular blocky structure; friable; many distinct very dark gray (10YR 3/1) organic stains on all faces of peds; few fine prominent strong brown (7.5YR 4/6) and common fine distinct grayish brown (2.5Y 5/4) masses of oxidized iron; neutral; clear wavy boundary.

Btg1—24 to 35 inches; gray (2.5Y 5/1) silty clay loam; moderate fine subangular blocky structure; friable; few distinct gray (10YR 5/1) clay films on faces of peds; few fine prominent dark yellowish brown (10YR 4/6), many fine distinct light olive brown (2.5Y 5/4), and many fine prominent yellowish brown (10YR 5/8) masses of oxidized iron; slightly acid; gradual wavy boundary.

Btg2—35 to 47 inches; gray (2.5Y 5/1) silty clay loam; moderate fine subangular blocky structure; friable; few distinct gray (10YR 5/1) clay films on faces of peds; common fine distinct light olive brown (2.5Y 5/4) and common fine prominent yellowish brown (10YR 5/8) masses of oxidized iron; slightly acid; clear wavy boundary.

2BCg1—47 to 52 inches; olive gray (5Y 5/2) and yellowish brown (10YR 5/8) loam; weak medium subangular blocky structure; friable; neutral; gradual wavy boundary.

2BCg2—52 to 80 inches; gray (10YR 6/1) and yellowish brown (10YR 5/8) loam; weak coarse subangular blocky structure; friable; about 5 percent mixed rock fragments; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 14 to 24 inches
Depth to till: 40 to 60 inches
Depth to carbonates: More than 40 inches
Other features: Some pedons have a stone line or thin layer (1 to 5 inches thick) of gravelly and sandy materials at the base of the silty or loamy sediments.

Ap or A horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam or silt loam
Reaction—strongly acid to neutral

BAg or Btg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay loam
Reaction—strongly acid to neutral
Content of rock fragments—a thin stone line with rock fragments up to 8 inches in diameter is commonly in the lower part of this horizon

2BC or 2C horizon:
Hue—7.5YR to 5Y
Value—4 to 6
Chroma—1 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline
Content of rock fragments—2 to 12 percent

Olin Series

Typical Pedon

Olin fine sandy loam, 2 to 5 percent slopes, in a pasture in Bremer County, Iowa; about 65 feet west and 1,543 feet south of the northeast corner of sec. 2, T. 93 N., R. 14 W.; USGS Tripoli NW (IA) topographic quadrangle; lat. 42 degrees 54 minutes 09.9 seconds N. and long. 92 degrees 27 minutes 22.2 seconds W.; NAD 83:

Ap—0 to 8 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; very friable; common fine roots; slightly acid; clear smooth boundary.
A—8 to 17 inches; very dark grayish brown (10YR 3/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; very friable; common fine roots; common distinct very dark brown (10YR 2/2) organic stains on all faces of peds; slightly acid; clear smooth boundary.
Bw1—17 to 24 inches; brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; very friable; common very fine roots; moderately acid; gradual smooth boundary.

Bw2—24 to 34 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; very friable; common very fine roots; strongly acid; gradual smooth boundary.

2Bw3—34 to 58 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; firm; about 5 percent mixed rock fragments; moderately acid; gradual smooth boundary.

2BC—58 to 80 inches; yellowish brown (10YR 5/6) loam; weak medium and coarse subangular blocky structure; firm; common medium distinct yellowish brown (10YR 5/8) redoximorphic concentrations; common medium prominent light brownish gray (2.5Y 6/2) redoximorphic depletions; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 20 inches
Depth to carbonates: More than 50 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—2
Texture—fine sandy loam or sandy loam
Reaction—moderately acid to neutral

Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—sandy loam
Reaction—strongly acid to neutral

2Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—loam, clay loam, or sandy clay loam
Reaction—strongly acid to neutral

2BC horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline

Oran Series

Typical Pedon

Oran loam, 1 to 3 percent slopes, in a cultivated field in Bremer County, Iowa; about 75 feet west and 758 feet south of the northeast corner of sec. 17, T. 93 N., R. 12 W.; USGS Tripoli (IA) topographic quadrangle; lat. 42 degrees 52 minutes 22.3 seconds N. and long. 92 degrees 16 minutes 41.6 seconds W.; NAD 83:

Ap—0 to 8 inches; very dark brown (10YR 2/2) loam, grayish brown (2.5Y 5/2) dry; moderate fine granular structure; friable; common fine roots; few prominent light gray (10YR 7/1) silt coatings on faces of peds; neutral; abrupt smooth boundary.

E—8 to 14 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak thin platy structure parting to weak fine subangular blocky; friable;

few fine roots; many prominent light gray (10YR 7/1) silt coatings on faces of peds; few fine and medium distinct yellowish brown (10YR 5/4) iron-manganese masses; moderately acid; clear wavy boundary.

BE—14 to 18 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate fine subangular blocky structure; friable; few very fine roots; common prominent light gray (10YR 7/1) silt coatings on faces of peds; common fine and medium prominent yellowish brown (10YR 5/6) iron-manganese masses; strongly acid; clear wavy boundary.

2Bt1—18 to 28 inches; yellowish brown (10YR 5/4) loam; moderate fine and medium subangular blocky structure; firm; many fine roots; common faint brown (10YR 4/3) clay films on faces of peds; common medium distinct gray (10YR 6/1) iron depletions; common medium distinct strong brown (7.5YR 5/6) iron-manganese masses; about 5 percent rock fragments; strongly acid; gradual wavy boundary.

2Bt2—28 to 52 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; firm; common distinct brown (10YR 4/3) clay films on faces of peds; many medium distinct gray (10YR 6/1) iron depletions; many medium distinct strong brown (7.5YR 5/6) iron-manganese masses; about 5 percent rock fragments; slightly acid; gradual wavy boundary.

2BC—52 to 80 inches; dark yellowish brown (10YR 4/4) loam; weak coarse subangular blocky structure; firm; common distinct brown (10YR 4/3) silt coatings on faces of peds; common medium distinct gray (10YR 6/1) iron depletions; common medium distinct yellowish brown (10YR 5/6) iron-manganese masses; slightly alkaline.

Range in Characteristics

Depth to till: 12 to 26 inches
Depth to carbonates: 40 to 70 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam or silt loam
Reaction—strongly acid to neutral

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam or loam
Reaction—strongly acid to neutral

BE horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 or 3
Texture—loam or silt loam
Reaction—strongly acid to neutral

Bt horizon (where present):
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—loam or sandy clay loam
Reaction—very strongly acid to slightly acid

2Bt horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—2 to 8
Texture—loam, clay loam, or sandy clay loam
Reaction—very strongly acid to slightly acid

2BC horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 6
Texture—loam
Reaction—slightly acid to moderately alkaline

Orion Series

Typical Pedon

Orion silt loam, 0 to 2 percent slopes, occasionally flooded, in an area of timber in Bremer County, Iowa, about 1/2 mile west of Denver; 1,480 feet north and 1,335 feet east of the southwest corner of sec. 23, T. 91 N., R. 13 W.; USGS Denver (IA) topographic quadrangle; lat. 42 degrees 40 minutes 31.4 seconds N. and long. 92 degrees 21 minutes 07.5 seconds W.; NAD 83:

A—0 to 6 inches; very dark grayish brown (10YR 3/2) and brown (10YR 5/3) silt loam, light brownish gray (10YR 6/2) dry; moderate medium subangular blocky structure; friable; slightly acid; gradual wavy boundary.

C1—6 to 16 inches; stratified brown (10YR 5/3), dark grayish brown (10YR 4/2), and very dark grayish brown (10YR 3/2) silt loam; massive with weak thin alluvial strata; friable; few fine distinct yellowish brown (10YR 5/6) masses of oxidized iron; neutral; gradual wavy boundary.

C2—16 to 30 inches; stratified brown (10YR 4/3), very dark grayish brown (10YR 3/2), and brown (10YR 5/3) silt loam; massive with weak thin alluvial strata; very friable; common medium distinct dark yellowish brown (10YR 4/6) masses of oxidized iron; neutral; gradual wavy boundary.

C3—30 to 53 inches; stratified very dark grayish brown (10YR 3/2), grayish brown (10YR 5/2), and dark grayish brown (10YR 4/2) silt loam; massive; very friable; common medium distinct dark yellowish brown (10YR 4/4) masses of oxidized iron; neutral; diffuse wavy boundary.

Ab—53 to 80 inches; very dark gray (2.5Y 3/1) silt loam; moderate medium subangular blocky structure; friable; common medium distinct olive gray (5Y 6/2) iron depletions; slightly acid.

Range in Characteristics

Depth to the buried horizon: 20 to 60 inches

A or Ap horizon:
Hue—10YR
Value—3 to 6
Chroma—2 or 3
Texture—dominantly silt loam; thin strata of silt, loam, very fine sandy loam, loamy very fine sand, or very fine sand in some pedons
Reaction—moderately acid to slightly alkaline
Note—colors of 3/2 and 3/3 have a dry value of 6 or more or are in thin strata; color and texture strata are common

C horizon:
Hue—10YR
Value—3 to 5
Chroma—2 or 3
Texture—silt loam; thin strata of silt, loam, very fine sandy loam, loamy very fine sand, or very fine sand in most pedons
Reaction—moderately acid to slightly alkaline

Ab horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—silt loam or silty clay loam; thin strata of coarser material in some pedons
Reaction—moderately acid to slightly alkaline

Bgb horizon (where present):
Hue—10YR, 2.5Y, 5Y, 5GY, 5G, 5BG, 5B, or N
Value—4 to 6
Chroma—0 to 2
Texture—silt loam; strata of silt, loam, very fine sandy loam, loamy very fine sand, or very fine sand in some pedons
Reaction—moderately acid to slightly alkaline

Ostrander Series

Typical Pedon

Ostrander loam, 2 to 5 percent slopes, in a cultivated field in Bremer County, Iowa; 735 feet north and 1,800 feet east of the southwest corner of sec. 30, T. 92 N., R. 14 W.; USGS Shell Rock (IA) topographic quadrangle; lat. 42 degrees 44 minutes 48.4 seconds N. and long. 92 degrees 32 minutes 51.8 seconds W.; NAD 83:

Ap—0 to 9 inches; black (10YR 2/1) loam, very dark grayish brown (10YR 3/2) dry; weak fine and medium subangular blocky structure; friable; many very fine and fine roots; slightly acid; abrupt smooth boundary.
A—9 to 15 inches; very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) dry; moderate fine and medium subangular blocky structure; friable; many very fine and fine roots; slightly acid; clear wavy boundary.
AB—15 to 19 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium subangular blocky structure; friable; common very fine and fine roots; slightly acid; clear wavy boundary.
Bw1—19 to 31 inches; dark yellowish brown (10YR 4/4) loam; moderate fine and medium subangular blocky structure; friable; few very fine roots; moderately acid; clear wavy boundary.
2Bw2—31 to 45 inches; dark yellowish brown (10YR 4/4) loam; weak coarse prismatic structure parting to moderate medium subangular blocky; friable; about 2 percent mixed rock fragments; moderately acid; abrupt smooth boundary.
2BC1—45 to 59 inches; yellowish brown (10YR 5/6) loam; weak medium and coarse prismatic structure; friable; about 2 percent mixed rock fragments; neutral; abrupt smooth boundary.
2BC2—59 to 80 inches; yellowish brown (10YR 5/6) loam; moderate coarse and extremely coarse prismatic structure dissected by few oblique fractures; firm; common fine prominent black (10YR 2/1) manganese masses; common medium distinct strong brown (7.5YR 5/8) masses of oxidized iron; about 5 percent mixed rock fragments; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to till: 30 to 60 inches
Depth to carbonates: More than 44 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loam, silt loam, clay loam, or silty clay loam
Reaction—moderately acid to neutral

AB or BA horizon (where present):
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—loam, silt loam, clay loam, or silty clay loam
Reaction—moderately acid to neutral

Bw horizon:
Hue—10YR
Value—3 or 4
Chroma—3 or 4
Texture—loam, silt loam, clay loam, or silty clay loam
Reaction—strongly acid to slightly acid

2Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—4 to 8
Texture—sandy loam, fine sandy loam, loam, sandy clay loam, or loamy sand
Reaction—strongly acid to neutral

2BC horizon:
Hue—7.5YR to 5Y
Value—4 to 8
Chroma—1 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline

Plano Series

Typical Pedon

Plano silty clay loam, rarely flooded, in an area of Wiota silty clay loam, 0 to 2 percent slopes, in a cultivated field in Black Hawk County, Iowa; about 2,575 feet north and 725 feet west of the southeast corner of sec. 14, T. 88 N., R. 13 W.; USGS Waterloo South (IA) topographic quadrangle; lat. 42 degrees 26 minutes 08.35 seconds N. and long. 92 degrees 19 minutes 12.63 seconds W.; NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

A1—8 to 18 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; common fine roots; neutral; clear smooth boundary.

A2—18 to 22 inches; very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.
Bt1—22 to 32 inches; brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable; common fine roots; few distinct very dark grayish brown (10YR 3/2) clay films on vertical faces of peds; slightly acid; gradual smooth boundary.
Bt2—32 to 41 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; friable; common fine roots; few distinct very dark grayish brown (10YR 3/3) clay films on vertical faces of peds; moderately acid; gradual wavy boundary.
2BC—41 to 48 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure; friable; about 5 percent mixed gravel; moderately acid; gradual wavy boundary.
2C1—48 to 54 inches; yellowish brown (10YR 5/6) sandy loam; single grain; loose; about 10 percent mixed gravel; moderately acid; gradual wavy boundary.
2C2—54 to 80 inches; yellowish brown (10YR 5/6) gravelly loamy sand; single grain; loose; about 20 percent mixed gravel; moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 18 to 24 inches
Depth to carbonates: More than 60 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam or silt loam
Reaction—slightly acid or neutral

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam
Reaction—moderately acid to neutral

2BC horizon (where present):
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—2 to 6
Texture—silt loam, loam, or sandy loam
Reaction—moderately acid to slightly alkaline

2C horizon:
Hue—10YR
Value—4 to 8
Chroma—2 to 6
Texture—sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand
Reaction—moderately acid to moderately alkaline

Taxadjunct features: The representative pedon for the Plano series in Bremer County is a taxadjunct because the thickness of the mollic epipedon meets the criteria for the Pachic subgroup. The representative pedon is classified as a fine-silty, mixed, superactive, mesic Pachic Argiudoll.

Port Byron Series

Typical Pedon

Port Byron silt loam, 2 to 5 percent slopes, in a cultivated field in Bremer County, Iowa; about 2,185 feet north and 163 feet east of the southwest corner of sec. 30, T. 91 N., R. 12 W.; USGS Denver (IA) topographic quadrangle; lat. 42 degrees 39 minutes 45.8 seconds N. and long. 92 degrees 19 minutes 01.4 seconds W.; NAD 83:

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak medium granular structure; friable; many very fine and fine roots; moderately acid; abrupt smooth boundary.

A—8 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium subangular blocky structure; friable; many very fine and fine roots; common distinct very dark gray (10YR 3/1) organic stains on faces of peds; slightly acid; clear wavy boundary.

BA—14 to 22 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and medium subangular blocky structure; friable; many very fine and fine roots; few prominent light gray (10YR 7/2) silt coatings on faces of peds; common distinct very dark grayish brown (10YR 3/2) organic stains on faces of peds; slightly acid; clear wavy boundary.

Bt1—22 to 33 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and medium subangular blocky structure; friable; common very fine and fine roots; common distinct brown (10YR 4/3) clay films on faces of peds; moderately acid; clear wavy boundary.

Bt2—33 to 47 inches; yellowish brown (10YR 5/4) silt loam; moderate medium and coarse subangular blocky structure; friable; few very fine roots; common distinct brown (10YR 4/3) clay films on faces of peds; moderately acid; clear wavy boundary.

BC—47 to 69 inches; brown (10YR 5/3) silt loam; moderate coarse subangular blocky structure; friable; few prominent light gray (10YR 7/2) silt coatings on faces of peds; common medium prominent black (10YR 2/1) manganese masses; slightly acid; clear wavy boundary.

C—69 to 80 inches; brown (10YR 5/3) silt loam; massive; friable; common medium prominent black (10YR 2/1) manganese masses; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam
Reaction—moderately acid to neutral

BA, Bw, or Bt horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam
Reaction—moderately acid to neutral

BC and C horizons:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 4

Texture—silt loam
Reaction—moderately acid to slightly alkaline

Taxadjunct features: The representative pedon for the moderately eroded Port Byron components is a taxadjunct because the thickness of the surface layer does not meet the criteria for a mollic epipedon. This pedon is classified as a fine-silty, mixed, superactive, mesic Dystric Eutrudept.

Readlyn Series

Typical Pedon

Readlyn loam, 1 to 3 percent slopes, in a permanent pasture in Bremer County, Iowa, about 1.5 miles north of Readlyn; 540 feet north and 2,375 feet east of the southwest corner of sec. 35, T. 92 N., R. 12 W.; USGS Readlyn (IA) topographic quadrangle; lat. 42 degrees 43 minutes 52 seconds N. and long. 92 degrees 13 minutes 47.4 seconds W.; NAD 83:

A1—0 to 9 inches; black (10YR 2/1) loam; weak fine granular structure; friable; many fine roots; moderately acid; clear wavy boundary.
A2—9 to 15 inches; very dark grayish brown (10YR 3/2) loam; weak fine granular and subangular blocky structure; friable; common fine roots; strongly acid; clear wavy boundary.
BA—15 to 19 inches; very dark grayish brown (10YR 3/2) loam; weak fine and medium subangular blocky structure; friable; common fine roots; strongly acid; clear wavy boundary.
Bw1—19 to 24 inches; dark grayish brown (10YR 4/2) loam; weak fine subangular blocky structure; friable; common fine roots; strongly acid; gradual wavy boundary.
2Bw2—24 to 35 inches; yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) clay loam; weak fine subangular blocky structure; friable; common fine roots; few fine distinct strong brown (7.5YR 5/8) redoximorphic concentrations; about 2 percent subrounded (2 to 75 millimeters) mixed rock fragments; moderately acid; gradual wavy boundary.
2Bg—35 to 46 inches; grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) clay loam; moderate fine and medium subangular blocky structure; firm; common very fine roots; very few fine and medium cylindrical very dark gray (10YR 3/1) clay coatings on surfaces along pores and root channels; few fine prominent strong brown (7.5YR 5/8) redoximorphic concentrations; about 2 percent subrounded (2 to 75 millimeters) mixed rock fragments; slightly acid; gradual wavy boundary.
2BCg—46 to 60 inches; grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; firm; very few fine and medium cylindrical very dark gray (10YR 3/1) clay coatings on surfaces along pores and root channels; few fine prominent strong brown (7.5YR 5/8) redoximorphic concentrations; about 5 percent subrounded (2 to 75 millimeters) mixed rock fragments; slightly effervescent; slightly alkaline; gradual wavy boundary.
2BC—60 to 80 inches; yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) loam; weak extremely coarse prismatic structure; firm; very few fine and medium cylindrical very dark gray (10YR 3/1) clay coatings on surfaces along pores and root channels; few fine faint strong brown (7.5YR 5/8) redoximorphic concentrations; about 2 percent subrounded (2 to 75 millimeters) mixed rock fragments; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 12 to 20 inches
Depth to carbonates: More than 40 inches
Depth to till: 14 to 30 inches
Other features: Some pedons have an AB horizon.

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam, clay loam, silty clay loam, or silt loam
Reaction—strongly acid to slightly acid

Bg or Bw horizon (where present):
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loam, clay loam, silty clay loam, or silt loam
Reaction—strongly acid to slightly acid

2Bw or 2Bg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 8
Texture—loam, clay loam, or sandy clay loam
Reaction—strongly acid to slightly alkaline

2BC horizon and 2C horizon (where present):
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—2 to 8
Texture—loam
Reaction—slightly acid to moderately alkaline

Rockton Series

Typical Pedon

Rockton loam, 5 to 9 percent slopes, in a cultivated field in Bremer County, Iowa; about 481 feet east and 545 feet south of the northwest corner of sec. 23, T. 92 N., R. 14 W.; USGS Plainfield (IA) topographic quadrangle; lat. 42 degrees 46 minutes 19.9 seconds N. and long. 92 degrees 28 minutes 25.5 seconds W.; NAD 83:

Ap—0 to 9 inches; very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; common very fine and fine roots; slightly acid; abrupt wavy boundary.

AB—9 to 12 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; friable; common very fine and fine roots; few distinct very dark brown (10YR 2/2) organic stains on faces of peds; moderately acid; clear wavy boundary.

Bt1—12 to 19 inches; brown (10YR 5/3) loam; moderate fine subangular blocky structure; friable; common very fine roots; few distinct dark brown (10YR 3/3) clay films on faces of peds; few distinct very dark grayish brown (10YR 3/2) organic stains on faces of peds; strongly acid; clear wavy boundary.

Bt2—19 to 25 inches; yellowish brown (10YR 5/4) clay loam; moderate fine subangular blocky structure; friable; common very fine roots; few distinct dark

brown (10YR 3/3) clay films on faces of peds; few distinct brown (10YR 4/3) organic stains on faces of peds; about 5 percent mixed rock fragments; strongly acid; clear wavy boundary.

2Bt3—25 to 27 inches; yellowish brown (10YR 5/4) clay; moderate fine subangular blocky structure; firm; few distinct dark brown (10YR 3/3) clay films on faces of peds; about 5 percent mixed rock fragments; moderately acid; abrupt smooth boundary.

2R—27 to 80 inches; limestone bedrock, weathered along joints and partially fractured in the upper 2 feet.

Range in Characteristics

Depth to limestone bedrock: 20 to 40 inches
Thickness of the mollic epipedon: 0 to 18 inches

A, Ap, or AB horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam, fine sandy loam, or silt loam
Reaction—strongly acid to slightly acid

B horizon:
Hue—10YR in the upper part; 5YR, 7.5YR, or 10YR in the lower part
Value—4 or 5
Chroma—3 or 4
Texture—loam, sandy clay loam, or clay loam
Reaction—strongly acid to slightly acid

2B horizon:
Hue—5YR, 7.5YR, or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—clay loam, silty clay loam, clay, or silty clay
Reaction—moderately acid to neutral

Sattre Series

Typical Pedon

Sattre loam, 0 to 2 percent slopes, rarely flooded, in a cultivated field in Bremer County, Iowa; about 1,850 feet south and 375 feet west of the northeast corner of sec. 23, T. 93 N., R. 12 W.; USGS Sumner SW (IA) topographic quadrangle; lat. 42 degrees 51 minutes 25.4 seconds N. and long. 92 degrees 13 minutes 13.3 seconds W.; NAD 83:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (2.5Y 5/2) dry; weak medium subangular blocky structure; friable; neutral; clear smooth boundary.

BE—9 to 13 inches; dark grayish brown (10YR 4/2) loam; moderate medium subangular blocky structure; friable; neutral; clear wavy boundary.

Bt1—13 to 20 inches; brown (10YR 4/3) loam; moderate medium subangular blocky structure; friable; common distinct very dark grayish brown (10YR 3/2) clay films on all faces of peds; about 2 percent rounded mixed rock fragments; neutral; gradual smooth boundary.

Bt2—20 to 33 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; common distinct very dark grayish brown

(10YR 3/2) clay films on all faces of peds; about 2 percent rounded mixed rock fragments; neutral; gradual smooth boundary.

2BC—33 to 46 inches; dark yellowish brown (10YR 4/4) loamy sand; weak fine subangular blocky structure; very friable; about 2 percent rounded mixed rock fragments and about 5 percent subrounded mixed rock fragments; neutral; gradual smooth boundary.

2C—46 to 80 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; about 2 percent rounded mixed rock fragments and about 10 percent subrounded mixed rock fragments; neutral.

Range in Characteristics

Depth to sand and gravel: 20 to 40 inches
Depth to carbonates: More than 60 inches
Other features: Some pedons have a BC horizon.

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam or silt loam
Reaction—strongly acid to neutral

E or BE horizon (where present):
Hue—10YR
Value—4
Chroma—2 or 3
Texture—loam or silt loam
Reaction—strongly acid to neutral

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—loam, clay loam, sandy loam, or sandy clay loam
Reaction—strongly acid to neutral

2C horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—sand, coarse sand, gravelly sand, or gravelly coarse sand; depositional strata of finer textures in some pedons
Reaction—strongly acid to neutral

Saude Series

Typical Pedon

Saude loam, on a south-facing, slightly convex slope of about 1 percent, in a cultivated field in Howard County, Iowa, about 3 1/2 miles north and 2 miles west of Elma; about 47 feet east and 67 feet north of the southwest corner of sec. 14, T. 98 N., R. 14 W.; USGS Saratoga topographic quadrangle; lat. 43 degrees 17 minutes 57 seconds N. and long. 92 degrees 28 minutes 31 seconds W.; NAD 83:

Ap—0 to 7 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; neutral; clear smooth boundary.

A—7 to 13 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; moderately acid; gradual smooth boundary.
BA—13 to 16 inches; dark brown (10YR 3/3) loam; faces of a few peds very dark grayish brown (10YR 3/2); brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; few black (10YR 2/1) wormcasts; moderately acid; clear smooth boundary.
Bw1—16 to 24 inches; dark yellowish brown (10YR 4/4) loam; faces of peds dark brown (10YR 3/3) and dark yellowish brown (10YR 3/4); weak medium subangular blocky structure; friable; common fine and few medium pores; moderately acid; gradual smooth boundary.
Bw2—24 to 28 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few fine and medium pores; moderately acid; abrupt smooth boundary.
2BC—28 to 36 inches; yellowish brown (10YR 5/4) loamy sand; single grain; loose; concentration of few rock fragments ($^{1}/_{8}$ inch to 3 inches in diameter) in the upper part; strongly acid; clear smooth boundary.
2C1—36 to 50 inches; dark yellowish brown (10YR 4/4) gravelly coarse sand; single grain; loose; about 25 percent rock fragments ($^{1}/_{8}$ inch to 3 inches in diameter); moderately acid; gradual smooth boundary.
2C2—50 to 60 inches; yellowish brown (10YR 5/6) gravelly coarse sand; single grain; loose; about 20 percent rock fragments ($^{1}/_{8}$ inch to 3 inches in diameter); moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to sandy and gravelly materials: 20 to 40 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam or sandy loam
Reaction—moderately acid to neutral

AB or BA horizon (where present):
Hue—7.5YR or 10YR
Value—2 to 4
Chroma—1 to 4
Texture—loam or sandy loam
Reaction—moderately acid to neutral

Bw horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—loam or sandy loam
Reaction—strongly acid or moderately acid

2BC horizon (where present) and 2C horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—gravelly coarse sand, coarse sand, loamy sand, or sand
Content of rock fragments—5 to 50 percent

Seaton Series

Typical Pedon

Seaton silt loam, 2 to 5 percent slopes, in a pasture in Bremer County, Iowa; about 507 feet west and 2,021 feet south of the northeast corner of sec. 22, T. 91 N., R. 13 W.; USGS Denver (IA) topographic quadrangle; lat. 42 degrees 40 minutes 48.6 seconds N. and long. 92 degrees 21 minutes 32.3 seconds W.; NAD 83:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

BE—9 to 16 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; friable; common very fine roots; moderately acid; clear smooth boundary.

Bt1—16 to 39 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; few distinct brown (10YR 4/3) clay films on faces of peds; moderately acid; clear smooth boundary.

Bt2—39 to 63 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few distinct brown (10YR 4/3) clay films on faces of peds; common medium distinct yellowish brown (10YR 5/6) masses of oxidized iron; strongly acid; gradual smooth boundary.

BC1—63 to 70 inches; yellowish brown (10YR 5/4) silt loam; moderate coarse subangular blocky structure; friable; few distinct gray (10YR 6/1) silt coatings on faces of peds; common medium distinct gray (10YR 6/1) iron depletions; common medium distinct strong brown (7.5YR 5/6) masses of oxidized iron; strongly acid; clear smooth boundary.

BC2—70 to 80 inches; brown (10YR 5/3) silt loam; moderate coarse subangular blocky structure; friable; few distinct gray (10YR 6/1) silt coatings on faces of peds; common medium faint light brownish gray (10YR 6/2) iron depletions; many medium prominent strong brown (7.5YR 5/8) masses of oxidized iron; moderately acid.

Range in Characteristics

Depth to carbonates: More than 60 inches

Ap or A horizon:
Hue—10YR
Value—2 to 4
Chroma—2 to 4
Texture—silt loam
Reaction—moderately acid to neutral

E horizon (where present):
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—silt loam
Reaction—moderately acid to neutral

BE or Bt horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 or 5
Chroma—3 to 6
Texture—silt loam
Reaction—very strongly acid to neutral

BC horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—silt loam
Reaction—strongly acid to neutral

Selmass Series

Typical Pedon

Selmass loam, on a nearly level, southwest-facing slope on an outwash plain in a cultivated field in McHenry County, Illinois, about 2.5 miles northeast of Union; 50 feet north and 600 feet east of the southwest corner of sec. 23, T. 44 N., R. 6 E.; USGS Marengo North topographic quadrangle; lat. 42 degrees 16 minutes 11 seconds N. and long. 88 degrees 30 minutes 31 seconds W.; NAD 27:

Ap—0 to 4 inches; black (N 2.5/) loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure parting to weak medium granular; friable; common very fine roots; neutral; abrupt smooth boundary.

A—4 to 11 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; friable; common very fine roots; common distinct black (N 2.5/) organic coatings on faces of peds and in pores; neutral; clear smooth boundary.

AB—11 to 15 inches; about 65 percent black (10YR 2/1) and 35 percent very dark grayish brown (2.5Y 3/2) loam, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; friable; common very fine roots; neutral; clear smooth boundary.

Btg1—15 to 20 inches; dark grayish brown (2.5Y 4/2) loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common very fine roots; few distinct dark gray (2.5Y 4/1) clay films and few distinct black (10YR 2/1) organic coatings on faces of peds and in pores; common fine distinct olive brown (2.5Y 4/4) masses of iron accumulation in the matrix; common fine and medium faint grayish brown (2.5Y 5/2) iron depletions in the matrix; about 1 percent gravel; neutral; gradual smooth boundary.

Btg2—20 to 30 inches; grayish brown (2.5Y 5/2) clay loam; moderate medium subangular blocky structure; friable; common very fine roots; few distinct dark gray (2.5Y 4/1) and dark grayish brown (2.5Y 4/2) clay films on faces of peds and in pores; common fine strong brown (7.5YR 4/6) very weakly cemented iron oxide concretions; common fine and medium distinct light olive brown (2.5Y 5/4) masses of iron accumulation in the matrix; about 2 percent gravel; neutral; gradual smooth boundary.

Btg3—30 to 42 inches; light olive gray (5Y 6/2) clay loam; weak medium and coarse subangular blocky structure; friable; few very fine roots; few distinct olive gray (5Y 5/2) clay films on faces of peds and in pores; common fine strong brown (7.5YR 4/6) very weakly cemented iron oxide concretions; very dark gray (10YR 3/1) krotovina; common fine and medium distinct light olive brown (2.5Y 5/4) masses of iron accumulation in the matrix; about 2 percent gravel; neutral; clear smooth boundary.

2BCg—42 to 47 inches; grayish brown (2.5Y 5/2) sandy loam; weak medium subangular blocky structure; very friable; few very fine roots; common medium and coarse distinct light olive brown (2.5Y 5/4) masses of iron accumulation in the matrix; about 4 percent gravel; neutral; clear wavy boundary.

2Cg—47 to 60 inches; grayish brown (2.5Y 5/2), stratified sand and loamy sand; single grain; loose; common medium and coarse prominent yellowish brown

(10YR 5/6) masses of iron accumulation in the matrix; about 4 percent gravel; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches

Ap, A, and/or AB horizon:
Hue—10YR, 2.5Y, or N
Value—2 or 3
Chroma—0 to 2
Texture—clay loam, loam, or silt loam
Reaction—moderately acid to slightly alkaline

BAg, Btg, or Bg horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—4 to 6
Chroma—0 to 2
Texture—clay loam, loam, silty clay loam, silt loam, sandy clay loam, fine sandy loam, or sandy loam
Reaction—moderately acid to slightly alkaline

2Btg, 2Bg, and/or 2BCg horizon:
Hue—10YR to 5Y
Value—5 or 6
Chroma—1 to 8
Texture—sandy loam, loam, or loamy sand
Reaction—slightly acid to moderately alkaline

2Cg and/or 2C horizon:
Hue—10YR to 5Y
Value—5 or 6
Chroma—1 to 6
Texture—sand or loamy sand
Reaction—slightly acid to moderately alkaline
Note—the sand fraction is more than 50 percent medium and coarse sand

Shandep Series

Typical Pedon

Shandep loam, 0 to 1 percent slopes, in a pasture in Franklin County, Iowa, about 8 miles east of Hampton; 1,675 feet south and 75 feet east of the northwest corner of sec. 36, T. 92 N., R. 19 W.; USGS Ackley NE (IA) topographic quadrangle; lat. 42 degrees 44 minutes 27 seconds N. and long. 93 degrees 02 minutes 41 seconds W.; NAD 83:

Ap—0 to 5 inches; black (N 2/) loam; moderate fine granular structure; friable; few pebbles; slightly acid; gradual smooth boundary.

A1—5 to 25 inches; black (N 2/) clay loam; moderate fine granular structure; friable; few pebbles; slightly acid; gradual smooth boundary.

A2—25 to 29 inches; black (5Y 2/1) and very dark gray (5Y 3/1) clay loam; weak medium granular structure; friable; few pebbles; slightly acid; clear wavy boundary.

Bg1—29 to 37 inches; dark gray (5Y 4/1) clay loam; weak fine and medium subangular blocky structure; friable; few pebbles; slightly acid; gradual wavy boundary.

Bg2—37 to 45 inches; gray (5Y 5/1) loam; weak fine and medium subangular blocky structure; friable; few pebbles; slightly acid; clear wavy boundary.
2Cg—45 to 60 inches; dark gray (5Y 4/1) loamy sand; single grain; loose; few pebbles; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 26 to 36 inches
Depth to carbonates: More than 40 inches
Depth to coarse material: 40 to 60 inches

Ap or A horizon:
Hue—5Y or N
Value—2 or 3
Chroma—0 or 1
Texture—clay loam, loam, or silty clay loam
Reaction—slightly acid to slightly alkaline

Bg horizon:
Hue—5Y or N
Value—4 or 5
Chroma—0 or 1
Texture—clay loam, loam, or silty clay loam
Reaction—slightly acid to slightly alkaline

2Cg horizon:
Hue—5Y
Value—4 or 5
Chroma—1 or 2
Texture—loamy sand, gravelly loamy sand, coarse sand, gravelly coarse sand, or gravelly loamy coarse sand
Reaction—slightly acid to moderately alkaline

Sigglekov Series

Typical Pedon

Sigglekov loam, 0 to 2 percent slopes, frequently flooded, in a timbered area on bottom land in Black Hawk County, Iowa; about 2,450 feet north and 350 feet east of the southwest corner of sec. 23, T. 90 N., R. 11 W.; USGS Littleton (IA) topographic quadrangle; lat. 42 degrees 35 minutes 34.3 seconds N. and long. 92 degrees 07 minutes 12.19 seconds W.; NAD 83:

A—0 to 9 inches; about 50 percent very dark grayish brown (10YR 3/2) and 50 percent very dark gray (10YR 3/1) loam, dark grayish brown (10YR 4/2) and dark gray (10YR 4/1) dry; moderate fine granular structure; friable; common fine and medium roots; common fine tubular pores; neutral; clear smooth boundary.
C1—9 to 15 inches; dark yellowish brown (10YR 4/4) sandy loam; massive; very friable; common fine and medium roots; common fine prominent strong brown (7.5YR 5/8) redoximorphic concentrations; common fine distinct light brownish gray (10YR 6/2) redoximorphic depletions; neutral; clear smooth boundary.
C2—15 to 20 inches; strong brown (7.5YR 4/6) sand; single grain; loose; common fine roots; neutral; clear smooth boundary.
C3—20 to 35 inches; yellowish brown (10YR 5/4) sand; single grain; loose; neutral; clear smooth boundary.
C4—35 to 80 inches; yellowish brown (10YR 5/4) coarse sand; single grain; loose; neutral.

Range in Characteristics

Depth to carbonates: More than 80 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loam, silt loam, or sandy loam
Reaction—very strongly acid to neutral

C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 6
Chroma—1 to 6
Texture—loamy sand, sand, or sandy loam
Reaction—very strongly acid to neutral

Sparta Series

Typical Pedon

Sparta loamy fine sand, 2 to 5 percent slopes, in a cultivated field in Bremer County, Iowa; about 104 feet south and 1,837 feet east of the northwest corner of sec. 32, T. 92 N., R. 14 W.; USGS Shell Rock (IA) topographic quadrangle; lat. 42 degrees 44 minutes 39.5 seconds N. and long. 92 degrees 31 minutes 39 seconds W.; NAD 83:

Ap—0 to 9 inches; very dark brown (10YR 2/2) loamy fine sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; common fine roots; moderately acid; clear smooth boundary.

AB—9 to 15 inches; dark brown (10YR 3/3) loamy fine sand, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; common very fine roots; moderately acid; clear smooth boundary.

Bw1—15 to 25 inches; brown (10YR 4/3) fine sand; weak coarse subangular blocky structure; very friable; common very fine roots; moderately acid; gradual smooth boundary.

Bw2—25 to 52 inches; yellowish brown (10YR 5/4) fine sand; weak coarse subangular blocky structure; very friable; moderately acid; gradual smooth boundary.

E and Bt—52 to 80 inches; yellowish brown (10YR 5/4) fine sand (E); single grain; loose; moderately acid; lamellae of dark yellowish brown (10YR 4/6) loamy sand (Bt) ($^1/_8$ to $^1/_2$ inch thick with total thickness of less than 6 inches); weak fine subangular blocky structure; very friable; few distinct brown (7.5YR 4/4) clay bridges between sand grains; very friable; moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Depth to lamellae: 45 to 80 inches
Depth to carbonates: More than 80 inches

Ap or A horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy fine sand, loamy sand, fine sand, or sand
Reaction—neutral to strongly acid

AB horizon:
Hue—7.5YR or 10YR
Value—3
Chroma—2 or 3
Texture—loamy fine sand, loamy sand, fine sand, or sand
Reaction—strongly acid to slightly acid

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 6
Chroma—3 to 6
Texture—loamy fine sand, loamy sand, fine sand, or sand
Reaction—strongly acid to slightly acid

E and Bt horizon:
Hue—7.5YR or 10YR
Value—5 or 6 (E); 3 to 5 (Bt)
Chroma—3 or 4 (E); 3 to 6 (Bt)
Texture—sand or fine sand (E); loamy sand, loamy fine sand, or fine sand (Bt)
Reaction—strongly acid to slightly acid

C horizon (where present):
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—sand or fine sand
Reaction—strongly acid to slightly alkaline

Spillville Series

Typical Pedon

Spillville loam, 0 to 2 percent slopes, occasionally flooded, in a pasture on a flood plain in Bremer County, Iowa; about 2,500 feet east and 300 feet north of the southwest corner of sec. 4, T. 91 N., R. 12 W.; USGS Denver (IA) topographic quadrangle; lat. 42 degrees 42 minutes 57 seconds N. and long. 92 degrees 16 minutes 07.1 seconds W.; NAD 83:

A1—0 to 18 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak very fine subangular blocky structure; friable; neutral; gradual smooth boundary.
A2—18 to 30 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; neutral; gradual smooth boundary.
A3—30 to 34 inches; black (10YR 2/1) loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.
A4—34 to 41 inches; very dark gray (10YR 3/1) loam, dark gray (2.5Y 4/1) dry; weak fine subangular blocky structure; very friable; common medium prominent strong brown (7.5YR 4/6) masses of oxidized iron; slightly acid; abrupt wavy boundary.
C1—41 to 73 inches; very dark gray (10YR 3/1) loam; massive; firm; few medium distinct dark yellowish brown (10YR 4/4) masses of oxidized iron; slightly acid; clear wavy boundary.
C2—73 to 80 inches; very dark gray (10YR 3/1) sandy loam; massive; friable; about 5 percent rounded mixed rock fragments; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 40 to 60 inches
Depth to carbonates: More than 40 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam or silt loam
Reaction—moderately acid to slightly alkaline

AC horizon (where present):
Hue—10YR or 2.5Y
Value—2 to 4
Chroma—1 or 2
Texture—loam, silt loam, sandy clay loam, fine sandy loam, or sandy loam
Reaction—moderately acid to neutral

C horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—1 to 3
Texture—loam, sandy clay loam, loamy sand, fine sandy loam, or sandy loam
Reaction—moderately acid to neutral

Tripoli Series

Typical Pedon

Tripoli clay loam, 0 to 2 percent slopes, in a cultivated field in Bremer County, Iowa; about 1,355 feet east and 34 feet north of the southwest corner of sec. 35, T. 93 N., R. 13 W.; USGS Tripoli (IA) topographic quadrangle; lat. 42 degrees 49 minutes 06.7 seconds N. and long. 92 degrees 21 minutes 08 seconds W.; NAD 83:

Ap—0 to 9 inches; black (N 2/) clay loam, very dark gray (N 3/) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A1—9 to 14 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; few distinct black (N 2/) organic stains on faces of peds; few distinct very dark grayish brown (10YR 3/2) silt coatings on faces of peds; neutral; gradual smooth boundary.

A2—14 to 18 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure parting to weak fine granular; friable; common fine faint very dark grayish brown (2.5Y 3/2) masses of oxidized iron; neutral; gradual smooth boundary.

Bg—18 to 24 inches; very dark grayish brown (2.5Y 3/2) and dark grayish brown (2.5Y 4/2) clay loam, grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) dry; weak medium subangular blocky structure; friable; few fine faint dark grayish brown (10YR 4/2) iron depletions; common fine prominent yellowish brown (10YR 5/6) masses of oxidized iron; neutral; gradual smooth boundary.

2Bw1—24 to 29 inches; olive brown (2.5Y 4/4) and light olive brown (2.5Y 5/4) loam; weak medium subangular blocky structure; friable; few fine distinct dark grayish brown (2.5Y 4/2) iron depletions; common fine distinct yellowish brown (10YR 5/6) masses of oxidized iron; about 5 percent mixed rock fragments; neutral; gradual smooth boundary.

2Bw2—29 to 38 inches; yellowish brown (10YR 5/6) loam; weak medium prismatic structure parting to moderate fine subangular blocky; firm; many medium

prominent grayish brown (2.5Y 5/2) iron depletions; many medium distinct strong brown (7.5YR 5/8) masses of oxidized iron; about 5 percent mixed rock fragments; neutral; gradual wavy boundary.

2BC1—38 to 66 inches; yellowish brown (10YR 5/6 and 5/8) and grayish brown (2.5Y 5/2) loam; weak very coarse prismatic structure; firm; few fine and medium carbonate masses; many medium distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/8) masses of oxidized iron; about 5 percent mixed rock fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

2BC2—66 to 80 inches; yellowish brown (10YR 5/4 and 5/6) and grayish brown (2.5Y 5/2) loam; weak very coarse prismatic structure; firm; few fine and medium carbonate masses; many medium faint yellowish brown (10YR 5/4) and many medium distinct strong brown (7.5YR 5/6) masses of oxidized iron; about 5 percent mixed rock fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 14 to 28 inches
Depth to carbonates: 36 to 48 inches
Depth to till: 18 to 28 inches; a faint to prominent stone line at the contact with the underlying till

Ap and A horizons:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—clay loam, loam, or silty clay loam with a high content of sand
Reaction—slightly acid or neutral
Content of rock fragments—less than 1 percent

AB or BA horizon (where present):
Hue—10YR to 5Y
Value—3 to 5
Chroma—1 or 2
Texture—clay loam, loam, or silty clay loam with a high content of sand
Reaction—slightly acid or neutral
Content of rock fragments—less than 1 percent

Bg horizon:
Hue—10YR to 5Y
Value—3 to 5
Chroma—1 to 6
Texture—clay loam or loam
Reaction—slightly acid to slightly alkaline
Content of rock fragments—less than 1 percent, except where the lower boundary of this horizon is at the contact with till, in which case a thin stone line may occur

2Bw horizon:
Hue—10YR to 5Y
Value—3 to 5
Chroma—1 to 6
Texture—loam, sandy clay loam, or clay loam
Reaction—neutral or slightly alkaline
Content of rock fragments—2 to 10 percent

2BC horizon:
Hue—10YR to 5Y
Value—3 to 5

Chroma—1 to 6
Texture—loam, sandy clay loam, or clay loam
Reaction—slightly acid to moderately alkaline
Content of rock fragments—2 to 10 percent

Waukee Series

Typical Pedon

Waukee loam, 2 to 5 percent slopes, rarely flooded, in a cultivated field in Bremer County, Iowa; about 932 feet west and 64 feet south of the northeast corner of sec. 20, T. 91 N., R. 14 W.; USGS Plainfield (IA) topographic quadrangle; lat. 42 degrees 51 minutes 42.7 seconds N. and long. 92 degrees 32 minutes 18.1 seconds W.; NAD 83:

Ap—0 to 9 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine and medium granular structure; friable; neutral; clear smooth boundary.
A—9 to 16 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; neutral; gradual smooth boundary.
Bw—16 to 30 inches; brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; many distinct very dark grayish brown (10YR 3/2) organic stains on faces of peds; moderately acid; gradual smooth boundary.
2BC—30 to 43 inches; dark yellowish brown (10YR 4/4) loamy sand; weak fine subangular blocky structure; friable; moderately acid; clear smooth boundary.
2C1—43 to 51 inches; dark yellowish brown (10YR 4/4) gravelly sand; single grain; loose; moderately acid; clear smooth boundary.
2C2—51 to 80 inches; yellowish brown (10YR 5/6) and brown (10YR 4/3) sand; single grain; loose; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: More than 72 inches
Depth to sandy or gravelly alluvium or outwash: 20 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2
Chroma—1 or 2
Texture—loam or silt loam
Reaction—strongly acid to neutral

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—loam or sandy clay loam
Reaction—strongly acid or moderately acid

2BC and 2C horizons:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 8
Texture—loamy sand, loamy coarse sand, sand, or coarse sand or the gravelly or very gravelly analogs of these textures
Reaction—moderately acid or slightly acid

Factors of Soil Formation

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by five major soil-forming factors: the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material (Jenny, 1941). Human activities also affect soil formation.

Climate and plant and animal life are the active factors of soil formation. They act on the parent material and slowly change it into a natural body that has genetically related horizons, or layers. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of profile that forms and in extreme cases determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil. Some time is always needed for the development of soil horizons. A long period of time generally is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the others.

Climate

The soils in Bremer County formed under the influence of a midcontinental, subhumid climate for at least 5,000 years. Between 5,000 and 16,000 years ago, the climate was conducive to the growth of forest vegetation (Ruhe, 1956a). The morphology and properties of most of the soils indicate that the climate under which they formed was similar to the present one. The climate is fairly uniform throughout the county but is marked by wide seasonal extremes in temperature. Precipitation is distributed throughout the year.

Climate is a major factor in determining what soils form in the various kinds of parent material. It affects the rate and intensity of hydrolysis, carbonation, oxidation, and other important chemical reactions in the soil. Temperature, rainfall, relative humidity, and length of the frost-free period affect the kind of vegetation on the soil.

The influence of the general climate in a region is modified by local conditions in or near the developing soils. For example, the poorly drained soils on bottom land formed under a wetter and cooler climate than most of the soils around them. These local differences influence the characteristics of the soil and account for some of the differences among soils in the same climatic region.

Living Organisms

Many changes in climate and vegetation have taken place in Iowa during the past 28,000 years (Ruhe, 1956b). The vegetation between about 28,000 and 11,000 years ago was dominated by coniferous forest with a transitional period of birch and alder. Deciduous forest dominated the vegetation 11,000 to 9,000 years ago. A very dry

period occurred between 9,000 and 3,200 years ago. Prairie vegetation was dominant during that period. Trees, especially oak trees, have invaded the prairie since 3,200 years ago, but the prairie vegetation is still dominant.

For the past 3,200 years, the soils in the county have been influenced by two main kinds of vegetation—prairie grasses and trees. Big bluestem and little bluestem were the main prairie grasses. The trees included oak, hickory, ash, elm, and maple.

Studies of the effects of vegetation on soils similar to those in the county indicate that vegetation shifted while soils developed in areas bordering both trees and grasses. The morphology of Kasson and Hayfield soils reflects the influence of trees and grasses. Chelsea soils reflect the influence of trees. Dinsdale, Kenyon, Readlyn, and Coland soils reflect the influence of grasses.

In most places the soils that formed under trees are lighter colored, are more acid, and have a thinner surface layer that is lower in organic matter content than soils that formed under grasses. The soils in the county that formed under a shifting vegetation or mixed grasses and trees have properties that are intermediate between the properties of soils that formed under grasses and those of soils that formed under trees.

Burrowing animals and earthworms help to keep the soil open and porous. Bacteria and fungi help to decompose vegetation, thus releasing nutrients for plants.

Topography

Topography can cause important differences among soils. It indirectly influences soil formation through its effect on drainage. The slope classes in the county range from nearly level to very steep. In many areas of bottom land, the nearly level soils are frequently flooded and have a permanent or seasonal high water table. Water soaks into the nearly level soils that are not flooded. Much of the rainfall runs off the moderately steep soils on uplands. The nearly level soils in the county are on broad upland flats and on stream terraces. The moderately steep soils are generally on slopes near the major streams and their tributaries. The intricate pattern of upland drainageways indicates that in most of the county the landscape has been modified by geologic processes.

Generally, the soils in Bremer County that formed in areas where the seasonal high water table was well below the subsoil have a yellowish brown subsoil. These include Ostrander, Dinsdale, and Dinsmore soils. Klinger, Klingmore, Marquis, and Readlyn soils formed in areas where the seasonal high water table fluctuated and was periodically high.

Coland, Maxfield, Maxmore, and Tripoli soils formed under prairie grasses. They have a seasonal high water table and are poorly drained. They have a higher content of organic matter in the surface layer than well drained soils that formed under prairie grasses.

Chelsea, Dinsdale, Kenyon, and Sparta soils, which have a wide range in slope, have some properties that change as slope increases. Two of these properties are the depth to carbonates and the thickness of the surface layer, both of which decrease as the slope increases.

Parent Material

The accumulation of parent material is the first step in the development of a soil. Most of the soils in the county formed in material that was transported from other locations and redeposited through the action of glacial ice, water, wind, or gravity. The main kinds of parent material in the county are drift, alluvium, sandy eolian material, and loess.

The landscape in the county has been studied in detail (Ruhe and others, 1968). It was previously thought of as the Iowan Surface; however, subsurface investigations have shown that Iowan till does not exist. An erosion-surface complex does exist in the northeastern Iowa till region. It is known as the Iowan erosional surface and is multileveled. It is arranged in a series of steps from the major drainageways toward boundary divides. The highest areas on the Iowan erosional surface are small elliptical hills or elongated ridges called pahas. Below the pahas, the Iowan erosional surface cuts into the Kansan till and a stone line or a layer of sand separates the loess and the glacial till. The stone line occurs on all levels of the stepped surfaces. It also underlies upland drainageways.

Drift is all rock material transported and deposited by glacial ice, including glacial till and the material sorted by meltwater. Glacial till is unsorted sediment in which particles range in size from boulders to clay. The Nebraskan Glaciation, which was the first of the glacial advances in the survey area, occurred 750,000 years ago (Ruhe, 1956a and 1956b). It was followed by the Kansan Glaciation, which occurred about 500,000 years ago.

In the southeastern part of the county, the till of the Kansan or Nebraskan Glaciation is overlain by 2 to 5 feet of loess. The different kinds of till are not readily differentiated in the county. Geologic erosion has removed the loess on some of the side slopes. The till of the glaciations and interglacial periods has been exposed on these side slopes. The Klinger-Maxfield association, which is described under the heading “General Soil Map Units,” has some areas of exposed glacial till. The till in this part of the county was truncated during the early part of the loess deposition in the Wisconsin age.

Alluvium is material deposited by water. Alluvial deposits of Late Wisconsin and Holocene age are on flood plains and terraces in Bremer County. About 20 percent of the soils in the county formed in alluvium. The major areas of these soils are along the Cedar and Wapsipinicon Rivers and their tributaries. The flood plains and alluvial terraces along these major drainageways can be quite large. The flood plain along the Cedar River north of Waverly is 0.25 to 1.0 mile wide. If alluvial terraces are added with the flood plain, the valley reaches more than 2 miles wide.

Much of the alluvium in the county washed from soils in the uplands. Because the upland soils in the northern part of the county are loamy, the alluvial sediments are loamy. Examples of loamy soils on flood plains are Coland and Spillville soils. These soils exhibit little horizon development. The soils on terraces or second bottoms are above the existing flood plain and are not flooded nearly as often. Most are underlain by coarser textured material within a depth of 2 to 5 feet. The coarser texture is commonly coarse sand and gravel, but in some areas it is coarse sand.

Although the soils on flood plains and terraces formed in material that was similar, the texture of the soils differs. Plano soils are silty and have less than 15 percent sand in the upper part. Marshan, Lawler, and Waukee soils are loamy and contain more than 15 percent sand throughout. Flagler soils are sandy and are relatively shallow to gravel.

Some of the alluvium has been transported only a short distance and has accumulated at the foot of the slope on which it originated. This material is called colluvium and retains many of the characteristics of the soils from which it has eroded. Floyd soils formed in colluvium.

Sandy eolian material, which is deposited by wind, covers about 10 percent of the county. It is in the uplands and on stream terraces along the Cedar and Wapsipinicon Rivers. It has a much higher content of sand than the loess deposits and a lower content of clay. This material occurs on uplands as low mounds or dunes on ridgetops and side slopes and on stream terraces as flats or gently rolling areas. The sandy eolian material mainly consists of fine and very fine quartz that is highly

resistant to weathering. It has been altered appreciably since it was deposited. Billett, Chelsea, Dickinson, and Sparta soils formed mainly in sandy eolian material.

Loess, which is a silty material deposited by wind, covers about 20 percent of the county. It ranges in depth from about 2 feet to more than 6 feet and is in the southern part of the county. In all areas it overlies glacial till. Dinsdale, Klinger, and Maxfield soils formed in 20 to 40 inches of loess. Dinsmore, Klingmore, and Maxmore soils formed in 40 to 60 inches of loess. Port Byron and Seaton soils formed in more than 6 feet of loess. They are on the stable upland divides of the Kansan till plain.

Time

Time is required for a soil to develop. A young soil has weakly defined horizons or does not show evidence of horizon development. Most of the soils on the flood plains are young soils because the soil material continues to accumulate and has not been in place long enough for distinct horizons to develop.

The effects of time are evidenced by the increase of clay in the subsoil. A higher content of clay in the subsoil than in the surface layer is an indication that a high degree of soil profile development has taken place. This information can be important because soils that have a high content of clay in the subsoil generally have poorer drainage.

Soil material generally is removed from soils on steep slopes before the soils have time to develop a thick profile and strong horizons. Also, much of the water runs off the slopes rather than infiltrating into the soil material, so that even though the material has been in place for a long time, the soil may exhibit little development.

Most of the parent material is thousands of years old. The present land surface and many of the soils are much younger because of recent geologic erosion (Ruhe, 1969). The oldest soils in the county formed on upland summits. These include Dinsdale, Dinsmore, Kenyon, Readlyn, Klinger, Klingmore, Marquis, Maxfield, and Maxmore soils. They may be 14,000 years old (Ruhe, 1956a). Soils that formed in alluvium or in sandy eolian material are only a few thousand years old or younger. Hayfield, Waukee, and Lawler soils formed on stream terraces, and Sigglekov and Spillville soils formed in alluvium on flood plains. Chelsea, Dickinson, and Sparta soils, which formed in sandy eolian material, are younger than the Hayfield, Waukee, and Lawler soils. Sigglekov and Spillville soils are younger than the Chelsea, Dickinson, and Sparta soils. The frequently flooded Spillville and Sigglekov soils formed in alluvium and are less than 150 years old.

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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the "National Soil Survey Handbook" (available in local offices of the Natural Resources Conservation Service or on the Internet).

Ablation till. Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl. A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction toward which a slope faces. Also called slope aspect.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope (fig. 8). In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Basal till. Compact till deposited beneath the ice.

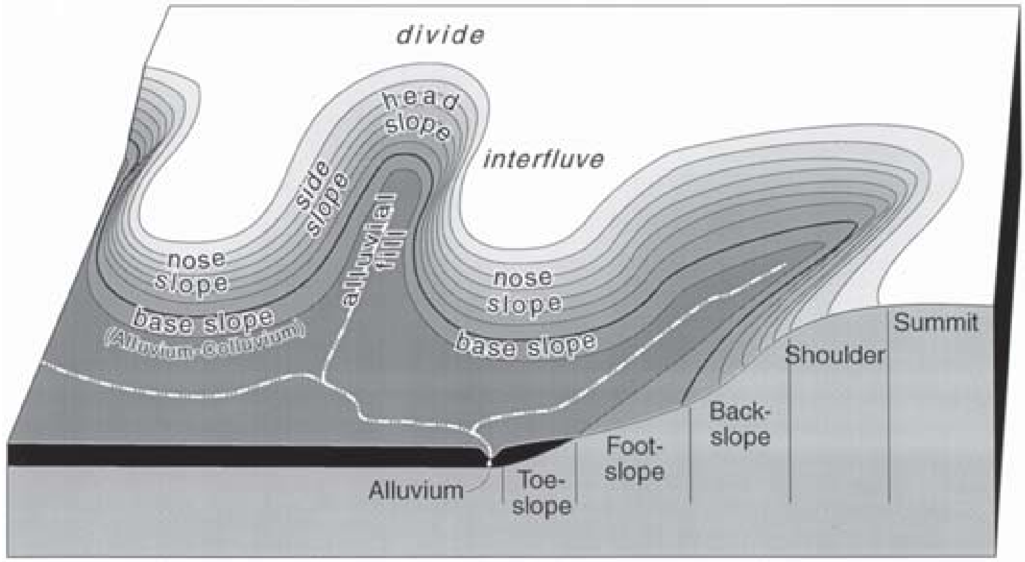

Figure 8.—Landscape relationship of geomorphic components and hillslope positions (modified after Ruhe and Walker, 1968).

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology). A geomorphic component of hills (fig. 8) consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Beach deposits. Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a post-glacial or glacial lake.

Bedding plane. A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed; the adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Bottom land. An informal term loosely applied to various portions of a flood plain.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. See Terracettes.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. See Redoximorphic features.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A dense, compact, slowly permeable subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them

separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. See Redoximorphic features.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology). A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations). Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delta. A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divide. (a) The line of separation, or (b) the summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins (fig. 8); it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Drift. A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Earthy fill. See Mine spoil.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit. Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Esker. A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms. A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay. A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step. An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial. Of or pertaining to rivers or streams; produced by stream or river action.

Footslope. The concave surface at the base of a hillslope (fig. 8). A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim (in tables). Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology). A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway (fig. 8). The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope. A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill (fig. 8).

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

L horizon.—A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Ice-walled lake plain. A relict surface marking the floor of an extinct lake basin that was formed on solid ground and surrounded by stagnant ice in a stable or unstable superglacial environment on stagnation moraines. As the ice melted, the

lake plain became perched above the adjacent landscape. The lake plain is well sorted, generally fine textured, stratified deposits.

Igneous rock. Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology). A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill (fig. 8); shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream. A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron depletions. See Redoximorphic features.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

Kame moraine. An end moraine that contains numerous kames. A group of kames along the front of a stagnant glacier, commonly comprising the slumped remnants of a formerly continuous outwash plain built up over the foot of rapidly wasting or stagnant ice.

Karst (topography). A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Ksat. Saturated hydraulic conductivity.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake bed. The bottom of a lake; a lake basin.

Lake plain. A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace. A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landslide. A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength. The soil is not strong enough to support loads.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Masses. See Redoximorphic features.

Meander belt. The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar. A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll. One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth's crust. Nearly all such rocks are crystalline.

Mine spoil. An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. A kind of map unit that has little or no natural soil and supports little or no vegetation.

MLRA (major land resource area). A geographic area characterized by a particular pattern of land uses, elevation and topography, soils, climate, water resources, and potential natural vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties

of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. See Redoximorphic features.

Nose slope (geomorphology). A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside (fig. 8). The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash. Stratified and sorted sediments (chiefly sand and gravel) removed or “washed out” from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain. An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace. An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Parts per million (ppm). The concentration of a substance in the soil, such as phosphorus or potassium, in one million parts of air-dried soil on a weight per weight basis.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. (See Saturated hydraulic conductivity.)

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Phosphorus. The amount of phosphorus available to plants at a depth of 30 to 42 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available phosphorus are:

Very low	less than 7.5 ppm
Low	7.5 to 13.0 ppm
Medium	13.0 to 22.5 ppm
High	more than 22.5 ppm

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitted outwash plain. An outwash plain marked by many irregular depressions, such as kettles, shallow pits, and potholes, which formed by melting of incorporated ice masses.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology). A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings. See Redoximorphic features.

Potassium. The amount of potassium available to plants at a depth of 12 to 24 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available potassium are:

Very low	less than 50 ppm
Low	50 to 79 ppm
Medium	79 to 125 ppm
High	more than 125 ppm

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. See Redoximorphic features.

Redoximorphic depletions. See Redoximorphic features.

Redoximorphic features. Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric

layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*

B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*

C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.

2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:

A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*

B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).

3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix. See Redoximorphic features.

Regolith. All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief. The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill. A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser. The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat). The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy's Law, a

law that describes the rate of water movement through porous media. Commonly abbreviated as “Ksat.” Terms describing saturated hydraulic conductivity are very high, 100 or more micrometers per second (14.17 or more inches per hour); high, 10 to 100 micrometers per second (1.417 to 14.17 inches per hour); moderately high, 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour); moderately low, 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour); low, 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour); and very low, less than 0.01 micrometer per second (less than 0.001417 inch per hour). To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike. All the soils of a given series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The convex, erosional surface near the top of a hillslope (fig. 8). A shoulder is a transition from summit to backslope.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope (geomorphology). A geomorphic component of hills consisting of a laterally planar area of a hillside (fig. 8). The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Slickensides (pedogenic). Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, the slope classes are as follows:

Nearly level	0 to 2 percent
Gently sloping	2 to 5 percent
Moderately sloping	5 to 9 percent
Strongly sloping	9 to 14 percent
Steep	14 to 25 percent
Very steep	25 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slope alluvium. Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons.

Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stagnation moraine. A body of drift released by the melting of a glacier that ceased flowing. Commonly but not always occurs near ice margins; composed of till, ice-contact stratified drift, and small areas of glacial lake sediment. Typical landforms are knob-and-kettle topography, locally including ice-walled lake plains.

Stone line. In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strath terrace. A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subglacial. Formed or accumulated in or by the bottom parts of a glacier or ice sheet.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope (fig. 8). It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Swale. A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine caused by uneven glacial deposition.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble

and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine. An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation). An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology). A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes. Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Till. Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain. An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The gently inclined surface at the base of a hillslope (fig. 8). Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread. The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Upland. An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill. The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

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In cooperation with Iowa Agriculture and Home Economics Experiment Station and Cooperative Extension Service, Iowa State University, and Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship

Soil Survey of Bremer County, Iowa

Part II

How To Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, the survey area is divided into groups of soils called associations. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the soil associations on the color-coded map legend, and then refer to the section **General Soil Map Units** in Part I for a general description of the soils in your area.

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets** in Part III. Note the number of the map sheet, and turn to that sheet. Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. The **Contents** in Part I lists the map units and shows the page where each map unit is described.

The **Contents** in Part II shows which table has information on a specific land use or soil property for each detailed soil map unit. Also, see the **Contents** in Part I and Part II for other sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 2007. Soil names and descriptions were approved in 2008. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2008. The most current official data are available through the NRCS Web Soil Survey (http://soils.usda.gov).

This survey was made cooperatively by the Natural Resources Conservation Service; the Iowa Agriculture and Home Economics Experiment Station and Cooperative Extension Service, Iowa State University; the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship; and the Bremer County Board of Supervisors. The survey is part of the technical assistance furnished to the Bremer County Soil and Water Conservation District.

Cover: Corn grows well in long, gently sloping areas of Readlyn loam, 1 to 3 percent slopes.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at http://www.nrcs.usda.gov.

Contents

Issued 2009

Soil Survey of
Bremer County, Iowa

Introduction to Part II

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

This part of the soil survey includes interpretations for various uses of the soils and data on soil properties. This information can be used to plan the use and management of soils for crops and pasture or as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Soils are rated in their natural state. No unusual modification of the soil site or material is made other than that which is considered normal practice for the rated use. Even though soils may have limitations, it is important to remember that engineers and others can modify soil features or can design or adjust the plans for a structure to compensate for most of the limitations. Most of these practices, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of gravel, sand, reclamation material, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The table “Classification of the Soils” is at the end of this section. Information about the system of soil taxonomy used by the Natural Resources Conservation Service is available in Part I of this publication. The extent of the map units in this survey area is shown in the table “Acreage and Proportionate Extent of the Soils.”

Interpretive Ratings

The interpretive tables in this survey rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and indicate

the severity of those limitations. The ratings in these tables are both verbal and numerical.

Rating Class Terms

Rating classes are expressed in the tables in terms that indicate the extent to which the soils are limited by all of the soil features that affect a specified use or in terms that indicate the suitability of the soils for the use. Thus, the tables may show limitation classes or suitability classes. Terms for the limitation classes are *not limited, somewhat limited,* and *very limited*. The suitability ratings are expressed as *well suited, moderately suited, poorly suited,* and *unsuited* or as *good, fair,* and *poor*.

Numerical Ratings

Numerical ratings in the tables indicate the relative severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use and the point at which the soil feature is not a limitation. The limitations appear in order from the most limiting to the least limiting. Thus, if more than one limitation is identified, the most severe limitation is listed first and the least severe one is listed last.

Classification of the Soils

(An asterisk in the first column indicates a taxadjunct to the series. See text in Part I for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Atkinson	Fine-loamy, mixed, superactive, mesic Typic Argiudolls
Backbone	Coarse-loamy, mixed, superactive, mesic Mollic Hapludalfs
Bassett	Fine-loamy, mixed, superactive, mesic Mollic Hapludalfs
Billett	Coarse-loamy, mixed, superactive, mesic Mollic Hapludalfs
Bremer	Fine, smectitic, mesic Typic Argiaquolls
Burkhardt	Sandy, mixed, mesic Typic Hapludolls
Chelsea	Mixed, mesic Lamellic Udipsamments
Clyde	Fine-loamy, mixed, superactive, mesic Typic Endoaquolls
Coland	Fine-loamy, mixed, superactive, mesic Cumulic Endoaquolls
Coloma	Mixed, mesic Lamellic Udipsamments
Copaston	Loamy, mixed, superactive, mesic Lithic Hapludolls
Dickinson	Coarse-loamy, mixed, superactive, mesic Typic Hapludolls
Dinsdale	Fine-silty, mixed, superactive, mesic Typic Argiudolls
Flagler	Coarse-loamy, mixed, superactive, mesic Pachic Hapludolls
Floyd	Fine-loamy, mixed, superactive, mesic Aquic Pachic Hapludolls
Fort Dodge	Fine-loamy, mixed, superactive, mesic Cumulic Hapludolls
Hayfield	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Aquollic Hapludalfs
Hoopeston	Coarse-loamy, mixed, superactive, mesic Aquic Hapludolls
Joy	Fine-silty, mixed, superactive, mesic Aquic Hapludolls
Kasson	Fine-loamy, mixed, superactive, mesic Mollic Oxyaquic Hapludalfs
Kenyon	Fine-loamy, mixed, superactive, mesic Typic Hapludolls
Klinger	Fine-silty, mixed, superactive, mesic Aquic Hapludolls
Klingmore	Fine-silty, mixed, superactive, mesic Aquic Hapludolls
Klossner	Loamy, mixed, euic, mesic Terric Haplosaprists
Lawler	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Aquic Hapludolls
Marquis	Fine-loamy, mixed, superactive, mesic Oxyaquic Hapludolls

Classification of the Soils--Continued

Soil name	Family or higher taxonomic class
Marshan	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Endoaquolls
Maxfield	Fine-silty, mixed, superactive, mesic Typic Endoaquolls
Maxmore	Fine-silty, mixed, superactive, mesic Typic Endoaquolls
Olin	Coarse-loamy, mixed, superactive, mesic Typic Hapludolls
Oran	Fine-loamy, mixed, superactive, mesic Aquollic Hapludalfs
Orion	Coarse-silty, mixed, superactive, nonacid, mesic Aquic Udifluvents
Ostrander	Fine-loamy, mixed, superactive, mesic Typic Hapludolls
*Plano	Fine-silty, mixed, superactive, mesic Pachic Argiudolls
Port Byron	Fine-silty, mixed, superactive, mesic Typic Hapludolls
*Port Byron	Fine-silty, mixed, superactive, mesic Dystric Eutrudepts
Readlyn	Fine-loamy, mixed, superactive, mesic Aquic Hapludolls
Rockton	Fine-loamy, mixed, superactive, mesic Typic Argiudolls
Sattre	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Mollic Hapludalfs
Saude	Coarse-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Hapludalfs
Seaton	Fine-silty, mixed, superactive, mesic Typic Hapludalfs
Selmass	Fine-loamy, mixed, superactive, mesic Typic Endoaquolls
Shandep	Fine-loamy, mixed, superactive, mesic Cumulic Endoaquolls
Sigglekov	Sandy, mixed, mesic Aquic Udorthents
Sparta	Sandy, mixed, mesic Entic Hapludolls
Spillville	Fine-loamy, mixed, superactive, mesic Cumulic Hapludolls
Tripoli	Fine-loamy, mixed, superactive, mesic Typic Endoaquolls
Waukee	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Hapludolls

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
41B	Sparta loamy fine sand, 2 to 5 percent slopes	4,425	1.6
41C	Sparta loamy fine sand, 5 to 9 percent slopes	2,099	0.7
43	Bremer silty clay loam, 0 to 2 percent slopes, rarely flooded	179	*
50B	Coloma loamy sand, 2 to 5 percent slopes, rarely flooded	404	0.1
63B	Chelsea loamy fine sand, 2 to 5 percent slopes	441	0.2
63C	Chelsea loamy fine sand, 5 to 9 percent slopes	788	0.3
63E	Chelsea loamy fine sand, 9 to 18 percent slopes	359	0.1
83B	Kenyon loam, 2 to 5 percent slopes	14,472	5.1
83C	Kenyon loam, 5 to 9 percent slopes	4,937	1.8
84	Clyde silty clay loam, 0 to 3 percent slopes	28,177	10.0
109B	Backbone sandy loam, 2 to 5 percent slopes	166	*
109C	Backbone sandy loam, 5 to 9 percent slopes	183	*
109D	Backbone sandy loam, 9 to 14 percent slopes	138	*
127	Plano silty clay loam, 0 to 2 percent slopes, rarely flooded	592	0.2
135	Coland clay loam, 0 to 2 percent slopes, occasionally flooded	2,378	0.8
153	Shandep loam, ponded, 0 to 1 percent slopes, occasionally flooded	1,122	0.4
173	Hoopeston sandy loam, terrace, 0 to 2 percent slopes, rarely flooded	1,188	0.4
175B	Dickinson fine sandy loam, 2 to 5 percent slopes	5,279	1.9
175C	Dickinson fine sandy loam, 5 to 9 percent slopes	827	0.3
178	Waukee loam, 0 to 2 percent slopes, rarely flooded	7,781	2.8
178B	Waukee loam, 2 to 5 percent slopes, rarely flooded	2,311	0.8
178C	Waukee loam, 5 to 9 percent slopes, rarely flooded	109	*
184	Klinger silty clay loam, 1 to 3 percent slopes	4,279	1.5
198B	Floyd loam, 1 to 4 percent slopes	25,793	9.2
221	Klossner muck, 1 to 3 percent slopes	435	0.2
284B	Flagler sandy loam, 1 to 4 percent slopes, rarely flooded	1,120	0.4

See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
285	Burkhardt sandy loam, 0 to 2 percent slopes, rarely flooded	418	0.1
285C	Burkhardt sandy loam, 2 to 9 percent slopes, rarely flooded	298	0.1
323B	Fort Dodge loam, 1 to 4 percent slopes	3,781	1.3
344D	Copaston loam, 5 to 14 percent slopes	396	0.1
344G	Copaston loam, 14 to 30 percent slopes	408	0.1
354	Aquolls, ponded, 0 to 1 percent slopes	962	0.3
377B	Dinsdale silty clay loam, 2 to 5 percent slopes	963	0.3
377C	Dinsdale silty clay loam, 5 to 9 percent slopes	44	*
382	Maxfield silty clay loam, 0 to 2 percent slopes	3,884	1.4
391B	Clyde-Floyd complex, 1 to 4 percent slopes	3,150	1.1
394B	Ostrander loam, 2 to 5 percent slopes	4,195	1.5
394C	Ostrander loam, 5 to 9 percent slopes	1,196	0.4
395B	Marquis loam, 2 to 5 percent slopes	12,415	4.4
398	Tripoli clay loam, 0 to 2 percent slopes	33,804	12.0
399	Readlyn loam, 1 to 3 percent slopes	35,139	12.5
408B	Olin fine sandy loam, 2 to 5 percent slopes	1,483	0.5
471	Oran loam, 1 to 3 percent slopes	5,639	2.0
485	Spillville loam, 0 to 2 percent slopes, occasionally flooded	1,926	0.7
582B	Kasson loam, 2 to 5 percent slopes	4,051	1.4
582C	Kasson loam, 5 to 9 percent slopes	452	0.2
585	Spillville-Coland complex, 0 to 2 percent slopes, occasionally flooded	2,595	0.9
620B	Port Byron silt loam, 2 to 5 percent slopes	781	0.3
620C2	Port Byron silt loam, 5 to 9 percent slopes, moderately eroded	768	0.3
626	Hayfield loam, 0 to 2 percent slopes, rarely flooded	4,548	1.6
663B	Seaton silt loam, 2 to 5 percent slopes	408	0.1
663C	Seaton silt loam, 5 to 9 percent slopes	963	0.3
663D2	Seaton silt loam, 9 to 14 percent slopes, moderately eroded	295	0.1
663D3	Seaton silt loam, 9 to 14 percent slopes, severely eroded	144	*
663E2	Seaton silt loam, 14 to 18 percent slopes, moderately eroded	384	0.1
663G	Seaton silt loam, 18 to 40 percent slopes	969	0.3
775	Billett sandy loam, 0 to 2 percent slopes	464	0.2
775B	Billett sandy loam, 2 to 5 percent slopes	816	0.3
775C	Billett sandy loam, 5 to 9 percent slopes	412	0.1
778	Sattre loam, 0 to 2 percent slopes, rarely flooded	1,642	0.6
813B	Atkinson loam, 2 to 5 percent slopes	1,221	0.4
813C	Atkinson loam, 5 to 9 percent slopes	278	*
814B	Rockton loam, 2 to 5 percent slopes	794	0.3
814C	Rockton loam, 5 to 9 percent slopes	1,024	0.4
814D	Rockton loam, 9 to 14 percent slopes	204	*
884	Klingmore silty clay loam, 1 to 3 percent slopes	655	0.2
930	Orion silt loam, 0 to 2 percent slopes, occasionally flooded	568	0.2
982	Maxmore silty clay loam, 0 to 2 percent slopes	1,136	0.4
1152	Marshan clay loam, 0 to 2 percent slopes, rarely flooded	7,744	2.8
1226	Lawler loam, 0 to 2 percent slopes, rarely flooded	5,146	1.8
1585	Spillville, channeled-Coland, channeled-Aquolls, ponded, complex, 0 to 2 percent slopes, frequently flooded	6,681	2.4
1586	Sigglekov-Fluvaquents, channeled-Aquents, ponded, complex, 0 to 2 percent slopes, frequently flooded	6,269	2.2
4946	Udorthents-Interstate highway complex, 0 to 5 percent slopes	1,212	0.4
5010	Pits, sand and gravel	56	*
5030	Pits, limestone quarries	200	*
5040	Udorthents, loamy	495	0.2
5080	Udorthents, sanitary landfill	70	*
8041	Sparta loamy sand, terrace, 0 to 2 percent slopes, rarely flooded	990	0.4
8041B	Sparta loamy sand, terrace, 2 to 5 percent slopes, rarely flooded	1,223	0.4
8175B	Dickinson fine sandy loam, terrace, 1 to 4 percent slopes, rarely flooded	2,643	0.9
AW	Animal waste lagoon	2	*
SL	Sewage lagoon	45	*
W	Water	2,669	0.9
	Total	281,100	100.0

* Less than 0.1 percent.

Agronomy

This section provides some general information about managing the soils for crops and for hay and pasture. The Iowa corn suitability rating system and the system of land capability classification used by the Natural Resources Conservation Service are explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil. Prime farmland is described, and interpretations for agricultural waste management are provided.

Planners of management systems for individual fields or farms should consider obtaining specific information from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Cropland Management Considerations

The management concerns affecting the use of the detailed soil map units in the county for crops are shown in the table "Cropland Management Considerations" at the end of this section. The main concerns in managing nonirrigated cropland are conserving moisture, controlling wind erosion and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the water infiltration rate. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Generally, a combination of several practices is needed to control wind erosion and water erosion. Conservation tillage, stripcropping, field windbreaks, contour farming, conservation cropping systems, crop residue management, terraces, diversions, and grassed waterways help to prevent excessive soil loss.

Measures that are effective in maintaining soil fertility include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients and thus helps to maintain productivity, although the level of fertility can be reduced even in areas where erosion is controlled. All soils used for nonirrigated crops respond well to applications of fertilizer.

Some of the considerations shown in the table cannot be easily overcome. These are channels, flooding, gullies, and ponding.

Additional considerations are as follows:

Lime content, limited available water capacity, limited content of organic matter, potential poor tilth and compaction, and restricted permeability.—These limitations can be minimized by incorporating green manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation cropping systems. Also, crops may respond well to additions of phosphate fertilizer to soils that have a high content of lime.

Potential for ground-water contamination.—The proper use of nutrients and pesticides can reduce the risk of ground-water contamination.

Potential for surface-water contamination.—The risk of surface-water contamination can be reduced by the proper use of nutrients and pesticides and by conservation farming practices that reduce the runoff rate.

Surface crusting.—This limitation retards seedling development after periods of heavy rainfall.

Surface rock fragments.—This limitation causes rapid wear of tillage equipment. It cannot be easily overcome.

Surface stones.—Stones or boulders on or near the surface can hinder normal tillage unless they are removed.

Salt content.—In areas where this is a limitation, only salt-tolerant crops should be grown.

On irrigated soils the main management concerns are efficient water use, nutrient management, control of erosion, pest and weed control, and timely planting and harvesting for a successful crop. An irrigation system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation wastes water, leaches plant nutrients, and causes erosion. Also, it can increase wetness and soil salinity.

Explanation of Criteria

Acid soil.—The pH is less than 6.1.

Channeled.—The word "channeled" is included in the map unit name.

Dense layer.—The bulk density is 1.80 g/cc or greater within the soil profile.
Depth to rock.—The depth to bedrock is less than 40 inches.
Eroded.—The word “eroded” is included in the map unit name.
Excessive permeability.—Saturated hydraulic conductivity is 42 micrometers per second or more within the soil profile.
Flooding.—Flooding is occasional, frequent, or very frequent.
Gullied.—The word “gullied” is included in the map unit name.
High content of organic matter.—The surface layer has more than 20 percent organic matter.
Lime content.—The pH is 7.4 or more in the surface layer, or the wind erodibility group is 4L.
Limited available water capacity.—The available water capacity calculated to a depth of 60 inches or to a root-limiting layer is 6 inches or less.
Limited content of organic matter.—The content of organic matter is 2 percent or less in the surface layer.
Ponding.—Ponding duration is assigned to the map unit component. Water is above the surface.
Potential poor tilth and compaction.—The content of clay is 27 percent or more in the surface layer.
Potential for ground-water contamination (by nutrients or pesticides).—The depth to a seasonal high water table is 4 feet or less, the saturated hydraulic conductivity of any layer is more than 42 micrometers per second, or the depth to bedrock is less than 60 inches.
Potential for surface-water contamination (by nutrients or pesticides).—The map unit component is occasionally, frequently, or very frequently flooded, is subject to ponding, is assigned to hydrologic group C or D and has a slope of more than 2 percent, is assigned to hydrologic group A and has a slope of more than 6 percent, or is assigned to hydrologic group B, has a slope of 3 percent or more, and has a K factor of more than 0.17.
Previously eroded.—The word “eroded” is included in the map unit name.
Restricted permeability.—Saturated hydraulic conductivity is less than 0.42 micrometer per second within the soil profile.
Salt content.—The electrical conductivity is 4 or more in the surface layer or 8 or more within a depth of 30 inches.
Slope (equipment limitation).—The slope is more than 15 percent.
Surface crusting.—The content of clay is 27 percent or more and the content of organic matter is 2 percent or less in the surface layer.
Surface rock fragments (equipment limitation).—The terms describing the texture of the surface layer include any rock fragment modifier, except for gravelly, channery, stony, very stony, extremely stony, bouldery, very bouldery, and extremely bouldery.
Surface stones (equipment limitation).—The word “stony” or “bouldery” is included in the description of the surface layer, or 0.01 to 0.1 percent of the surface is covered by stones or boulders.
Water erosion.—Either the slope is 6 percent or more, or the slope is more than 3 percent and less than 6 percent and the surface layer is not sandy.
Water table.—A water table is within 2.5 feet of the surface.
Wind erosion.—The wind erodibility group is 1, 2, 3, or 4L.

Hydrologic groups are described under the heading “Water Features.” Erosion factors (e.g., K factor) and wind erodibility groups are described under the heading “Physical Properties.”

Cropland Management Considerations

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Pct. of map unit	Cropland management considerations
41B:		
Sparta	80	Acid soil Limited available water capacity Limited content of organic matter Potential for ground-water contamination Wind erosion
41C:		
Sparta	80	Acid soil Limited available water capacity Limited content of organic matter Potential for ground-water contamination Potential for surface-water contamination Wind erosion
43:		
Bremer	100	Potential poor tilth and compaction Potential for ground-water contamination Water table
50B:		
Coloma	85	Limited available water capacity Limited content of organic matter Potential for ground-water contamination Wind erosion
63B:		
Chelsea	90	Limited available water capacity Limited content of organic matter Potential for ground-water contamination Wind erosion
63C:		
Chelsea	85	Limited available water capacity Limited content of organic matter Potential for ground-water contamination Potential for surface-water contamination Wind erosion
63E:		
Chelsea	85	Slope Limited available water capacity Limited content of organic matter Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
83B:		
Kenyon	75	Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion
83C:		
Kenyon	75	Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Pct. of map unit	Cropland management considerations
84:		
Clyde	80	Potential for ground-water contamination Restricted permeability Water table
109B:		
Backbone	100	Acid soil Depth to rock Limited available water capacity Limited content of organic matter Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion Wind erosion
109C:		
Backbone	100	Acid soil Depth to rock Limited available water capacity Limited content of organic matter Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion Wind erosion
109D:		
Backbone	100	Acid soil Depth to rock Limited available water capacity Limited content of organic matter Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion Wind erosion
127:		
Plano, rarely flooded	85	Potential for ground-water contamination
135:		
Coland, occasionally flooded	85	Flooding Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Water table
153:		
Shandep, ponded, occasionally flooded	75	Ponding Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Water table
173:		
Hoopeston, rarely flooded	100	Excessive permeability Potential for ground-water contamination Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Pct. of map unit	Cropland management considerations
175B:		
Dickinson	90	Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion
175C:		
Dickinson	100	Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
178:		
Waukee, rarely flooded	85	Acid soil Potential for ground-water contamination
178B:		
Waukee, rarely flooded	95	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion
178C:		
Waukee, rarely flooded	95	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion
184:		
Klinger	100	Potential for ground-water contamination Restricted permeability Water table
198B:		
Floyd	90	Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion Water table
221:		
Klossner	100	High content of organic matter Potential for ground-water contamination Restricted permeability Water table Wind erosion
284B:		
Flagler	90	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion
285:		
Burkhardt	100	Limited available water capacity Potential for ground-water contamination Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Pct. of map unit	Cropland management considerations
285C:		
Burkhardt	100	Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
323B:		
Fort Dodge	85	Potential for ground-water contamination Water erosion
344D:		
Copaston	90	Depth to rock Lime content Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion Wind erosion
344G:		
Copaston	85	Slope Depth to rock Lime content Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion Wind erosion
354:		
Aquolls, ponded	90	Onsite investigation required
377B:		
Dinsdale	90	Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion
377C:		
Dinsdale	90	Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion
382:		
Maxfield	100	Potential poor tilth and compaction Potential for ground-water contamination Restricted permeability Water table
391B:		
Clyde	60	Potential for ground-water contamination Restricted permeability Water erosion Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Pct. of map unit	Cropland management considerations
391B:		
Floyd	35	Potential for ground-water contamination
		Potential for surface-water contamination
		Restricted permeability
		Water erosion
		Water table
394B:		
Ostrander	75	Potential for surface-water contamination
		Restricted permeability
		Water erosion
394C:		
Ostrander	85	Potential for surface-water contamination
		Restricted permeability
		Water erosion
395B:		
Marquis	80	Potential for ground-water contamination
		Potential for surface-water contamination
		Restricted permeability
		Water erosion
		Water table
398:		
Tripoli	90	Potential poor tilth and compaction
		Potential for ground-water contamination
		Restricted permeability
		Water table
399:		
Readlyn	85	Potential for ground-water contamination
		Restricted permeability
		Water table
408B:		
Olin	80	Potential for ground-water contamination
		Potential for surface-water contamination
		Restricted permeability
		Water erosion
		Wind erosion
471:		
Oran	85	Potential for ground-water contamination
		Restricted permeability
		Water table
485:		
Spillville, occasionally flooded	80	Flooding
		Potential for ground-water contamination
		Potential for surface-water contamination
		Water table
582B:		
Kasson	90	Potential for ground-water contamination
		Potential for surface-water contamination
		Restricted permeability
		Water erosion
		Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Pct. of map unit	Cropland management considerations
582C:		
Kasson	80	Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion Water table
585:		
Spillville, occasionally flooded	50	Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
Coland, occasionally flooded	30	Flooding Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Water table
620B:		
Port Byron	90	Potential for surface-water contamination Water erosion
620C2:		
Port Byron	100	Potential for surface-water contamination Previously eroded Water erosion
626:		
Hayfield, rarely flooded	90	Acid soil Potential for ground-water contamination Water table
663B:		
Seaton	100	Limited content of organic matter Potential for surface-water contamination Water erosion
663C:		
Seaton	100	Limited content of organic matter Potential for surface-water contamination Water erosion
663D2:		
Seaton, moderately eroded	90	Limited content of organic matter Potential for surface-water contamination Previously eroded Water erosion
663D3:		
Seaton, severely eroded	90	Limited content of organic matter Potential for surface-water contamination Previously eroded Water erosion
663E2:		
Seaton, moderately eroded	90	Slope Limited content of organic matter Potential for surface-water contamination Previously eroded Water erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Pct. of map unit	Cropland management considerations
663G:		
Seaton-----------------------	90	Slope
		Limited content of organic matter
		Potential for surface-water contamination
		Water erosion
775:		
Billett----------------------	100	Excessive permeability
		Limited content of organic matter
		Potential for ground-water contamination
		Wind erosion
775B:		
Billett----------------------	100	Excessive permeability
		Limited content of organic matter
		Potential for ground-water contamination
		Water erosion
		Wind erosion
775C:		
Billett----------------------	100	Excessive permeability
		Limited content of organic matter
		Potential for ground-water contamination
		Potential for surface-water contamination
		Water erosion
		Wind erosion
778:		
Sattre, rarely flooded-------	85	Potential for ground-water contamination
813B:		
Atkinson---------------------	90	Acid soil
		Potential for ground-water contamination
		Potential for surface-water contamination
		Restricted permeability
		Water erosion
813C:		
Atkinson---------------------	85	Acid soil
		Potential for ground-water contamination
		Potential for surface-water contamination
		Restricted permeability
		Water erosion
814B:		
Rockton----------------------	90	Depth to rock
		Limited available water capacity
		Potential for ground-water contamination
		Potential for surface-water contamination
		Restricted permeability
		Water erosion
814C:		
Rockton----------------------	85	Depth to rock
		Limited available water capacity
		Potential for ground-water contamination
		Potential for surface-water contamination
		Restricted permeability
		Water erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Pct. of map unit	Cropland management considerations
814D:		
Rockton	90	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water erosion
884:		
Klingmore	100	Potential for ground-water contamination Restricted permeability Water table
930:		
Orion, occasionally flooded	100	Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
982:		
Maxmore	100	Potential for ground-water contamination Restricted permeability Water table
1152:		
Marshan, rarely flooded	75	Potential for ground-water contamination Water table
1226:		
Lawler, rarely flooded	80	Potential for ground-water contamination Water table
1585:		
Spillville, channeled	40	Flooding Channeled Potential for ground-water contamination Potential for surface-water contamination Water table
Coland, channeled	35	Flooding Channeled Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Water table
Aquolls, ponded	15	Onsite investigation required
1586:		
Sigglekov, frequently flooded	55	Flooding Channeled Limited available water capacity Limited content of organic matter Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
Fluvaquents, frequently flooded	30	Onsite investigation required
Aquents, ponded	15	Onsite investigation required

Cropland Management Considerations--Continued

Map symbol and soil name	Pct. of map unit	Cropland management considerations
4946:		
Udorthents	65	Onsite investigation required
Interstate highway	35	Not applicable
5010. Pits, sand and gravel		
5030. Pits, limestone quarries		
5040:		
Udorthents, loamy	100	Onsite investigation required
5080. Udorthents, sanitary landfill		
8041:		
Sparta, terrace, rarely flooded	80	Acid soil Limited available water capacity Limited content of organic matter Potential for ground-water contamination Wind erosion
8041B:		
Sparta, terrace, rarely flooded	80	Acid soil Limited available water capacity Limited content of organic matter Potential for ground-water contamination Wind erosion
8175B:		
Dickinson, terrace, rarely flooded	100	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion
AW. Animal waste lagoon		
SL. Sewage lagoon		
W. Water		

Crop Yield Estimates

The tables “Land Capability, Corn Suitability Rating, and Yields per Acre of Crops” and “Land Capability and Yields per Acre of Pasture” are described in this section. Crops other than those shown in the tables are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forestland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the

soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, forestland, or wildlife habitat.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, 2e-4 and 3e-6. These units are not given in all soil surveys.

[Reference: United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. USDA Handbook 210.]

Corn Suitability Rating

The corn suitability rating (CSR) system was developed in Iowa to rate the productivity of each different kind of soil for row crops. CSRs provide a relative ranking of all soils mapped in the State of Iowa. They can be used to compare the potential yield production of one soil with that of other soils. Ratings range from 5 to 100. A rating of 5 indicates severe limitations for row crop production. Soil properties and weather conditions are the dominant factors that affect productivity.

Crop Yields

The average yields per acre that can be expected of the principal crops under a high level of management are shown in the table. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Pasture Yields

Some pasture yields are expressed in the table in terms of animal unit months. An animal unit month (AUM) is the amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

The local office of the Natural Resources Conservation Service or the Cooperative Extension Service can provide information about forage yields other than those shown in the table.

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops

(The crop yield estimates were determined through recent research conducted by Iowa State University. They are based on a high level of management and are for nonirrigated areas. See text for additional information. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Pct. of map unit	Land capability	Corn suitability rating	Corn	Soybeans	Oats
				Bu	Bu	Bu
41B---------------------- Sparta	80	4s	40	144	39	58
41C---------------------- Sparta	80	4s	25	124	33	50
43----------------------- Bremer	100	2w	82	201	54	80
50B---------------------- Coloma	85	4s	36	139	38	56
63B---------------------- Chelsea	90	4s	36	139	38	56
63C---------------------- Chelsea	85	4s	21	118	32	47
63E---------------------- Chelsea	85	6s	5	97	26	39
83B---------------------- Kenyon	75	2e	86	206	56	82
83C---------------------- Kenyon	75	3e	71	186	50	74
84----------------------- Clyde	80	2w	76	193	52	77
109B--------------------- Backbone	100	4s	25	124	33	50
109C--------------------- Backbone	100	4s	10	104	28	42
109D--------------------- Backbone	100	6s	5	97	26	39
127---------------------- Plano, rarely flooded	85	1	95	218	59	87
135---------------------- Coland, occasionally flooded	85	2w	80	198	53	79
153---------------------- Shandep, ponded, occasionally flooded	75	3w	60	171	46	68
173---------------------- Hoopeston, rarely flooded	100	2s	60	171	46	68
175B--------------------- Dickinson	90	3e	55	164	44	66

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Pct. of map unit	Land capability	Corn suitability rating	Corn	Soybeans	Oats
				Bu	Bu	Bu
175C--------------------- Dickinson	100	3e	40	144	39	58
178---------------------- Waukee, rarely flooded	85	2s	79	197	53	79
178B--------------------- Waukee, rarely flooded	95	2e	74	190	51	76
178C--------------------- Waukee, rarely flooded	95	3e	59	170	46	68
184---------------------- Klinger	100	1	90	212	57	85
198B--------------------- Floyd	90	2w	80	198	53	79
221---------------------- Klossner	100	3w	50	158	43	63
284B--------------------- Flagler	90	3e	45	151	41	60
285---------------------- Burkhardt	100	3s	30	131	35	52
285C--------------------- Burkhardt	100	3e	5	97	26	39
323B--------------------- Fort Dodge	85	2e	72	187	50	75
344D--------------------- Copaston	90	4s	5	97	26	39
344G--------------------- Copaston	85	6e	5	97	26	39
354---------------------- Aquolls, ponded	90	5w	5	97	26	39
377B--------------------- Dinsdale	90	2e	90	212	57	85
377C--------------------- Dinsdale	90	3e	75	191	52	76
382---------------------- Maxfield	100	2w	90	212	57	85
391B---------------------			72	187	50	75
Clyde--------------------	60	2w				
Floyd--------------------	35	2w				
394B--------------------- Ostrander	75	2e	85	205	55	82
394C--------------------- Ostrander	85	3e	70	185	50	74

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Pct. of map unit	Land capability	Corn suitability rating	Corn	Soybeans	Oats
				Bu	Bu	Bu
395B--------------------- Marquis	80	2e	89	210	57	84
398--------------------- Tripoli	90	2w	81	199	54	80
399--------------------- Readlyn	85	1	91	213	58	85
408B--------------------- Olin	80	2e	66	179	48	72
471--------------------- Oran	85	1	86	206	56	82
485--------------------- Spillville, occasionally flooded	80	2w	92	214	58	86
582B--------------------- Kasson	90	2e	84	203	55	81
582C--------------------- Kasson	80	3e	69	183	49	73
585---------------------			86	171	46	68
Spillville, occasionally flooded----------------	50	2w				
Coland, occasionally flooded----------------	30	2w				
620B--------------------- Port Byron	90	2e	95	218	59	87
620C2-------------------- Port Byron	100	3e	78	195	53	78
626--------------------- Hayfield, rarely flooded	90	2s	67	180	49	72
663B--------------------- Seaton	100	2e	85	205	55	82
663C--------------------- Seaton	100	3e	70	185	50	74
663D2-------------------- Seaton, moderately eroded	90	3e	58	168	45	67
663D3-------------------- Seaton, severely eroded	90	4e	55	164	44	66
663E2-------------------- Seaton, moderately eroded	90	4e	48	155	42	62
663G--------------------- Seaton	90	6e	20	117	32	47

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Pct. of map unit	Land capability	Corn suitability rating	Corn	Soybeans	Oats
				Bu	Bu	Bu
775: Billett	100	2e	57	167	45	67
775B: Billett	100	2e	52	160	43	64
775C: Billett	100	3e	37	140	38	56
778: Sattre, rarely flooded	85	2s	74	190	51	76
813B: Atkinson	90	2e	80	198	53	79
813C: Atkinson	85	3e	65	178	48	71
814B: Rockton	90	2e	58	168	45	67
814C: Rockton	85	3e	43	148	40	59
814D: Rockton	90	4e	33	135	36	54
884: Klingmore	100	1	95	218	59	87
930: Orion, occasionally flooded	100	2w	75	191	52	76
982: Maxmore	100	2w	93	216	58	86
1152: Marshan, rarely flooded	75	2w	68	182	49	73
1226: Lawler, rarely flooded	80	2s	72	187	50	75
1585:			5	97	26	39
Spillville, channeled	40	5w				
Coland, channeled	35	5w				
Aquolls, ponded	15	5w				
1586:			5	97	26	39
Sigglekov, frequently flooded	55	5w				
Fluvaquents, frequently flooded	30	7w				
Aquents, ponded	15	5w				
4946. Udorthents-Interstate highway						
5010. Pits, sand and gravel						

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Pct. of map unit	Land capability	Corn suitability rating	Corn	Soybeans	Oats
				Bu	Bu	Bu
5030. Pits, limestone quarries						
5040--------------------- Udorthents, loamy	100	---	5	---	---	---
5080. Udorthents, sanitary landfill						
8041--------------------- Sparta, terrace, rarely flooded	80	4s	45	151	41	60
8041B-------------------- Sparta, terrace, rarely flooded	80	4s	40	144	39	58
8175B-------------------- Dickinson, terrace, rarely flooded	100	3e	55	164	44	66
AW. Animal waste lagoon						
SL. Sewage lagoon						
W. Water						

Land Capability and Yields per Acre of Pasture

(Yields are those that can be expected under a high level of management. They are for nonirrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Pct. of map unit	Land capability	Bromegrass-alfalfa hay	Smooth bromegrass	Kentucky bluegrass	Bromegrass-alfalfa
			Tons	AUM*	AUM*	AUM*
41B---------------------- Sparta	80	4s	3.5	3.5	2.1	4.4
41C---------------------- Sparta	80	4s	3.4	3.5	2.0	4.4
43----------------------- Bremer	100	2w	3.3	4.5	2.7	5.6
50B---------------------- Coloma	85	4s	2.8	2.7	1.6	3.4
63B---------------------- Chelsea	90	4s	3.1	3.0	1.8	3.8
63C---------------------- Chelsea	85	4s	2.8	2.8	1.7	3.5
63E---------------------- Chelsea	85	6s	2.6	2.6	1.5	3.3
83B---------------------- Kenyon	75	2e	6.6	6.4	3.8	8.0
83C---------------------- Kenyon	75	3e	6.3	6.2	3.7	7.8
84----------------------- Clyde	80	2w	4.5	5.9	3.5	7.4
109B--------------------- Backbone	100	4s	2.2	2.1	1.3	2.6
109C--------------------- Backbone	100	4s	2.0	1.9	1.1	2.4
109D--------------------- Backbone	100	6s	1.8	1.7	1.0	2.1
127---------------------- Plano, rarely flooded	85	1	6.6	6.5	3.9	8.1
135---------------------- Coland, occasionally flooded	85	2w	4.2	5.6	3.4	7.0
153---------------------- Shandep, ponded, occasionally flooded	75	3w	3.1	4.2	2.5	5.3
173---------------------- Hoopeston, rarely flooded	100	2s	4.7	4.6	2.8	5.8

See footnote at end of table.

Land Capability and Yields per Acre of Pasture--Continued

Map symbol and soil name	Pct. of map unit	Land capability	Bromegrass-alfalfa hay	Smooth bromegrass	Kentucky bluegrass	Bromegrass-alfalfa
			Tons	AUM*	AUM*	AUM*
175B--------------------- Dickinson	90	3e	4.5	4.4	2.6	5.5
175C--------------------- Dickinson	100	3e	4.4	4.3	2.6	5.4
178---------------------- Waukee, rarely flooded	85	2s	5.4	5.3	3.2	6.6
178B--------------------- Waukee, rarely flooded	95	2e	5.4	5.3	3.1	6.6
178C--------------------- Waukee, rarely flooded	95	3e	4.9	5.0	3.1	6.3
184---------------------- Klinger	100	1	6.7	6.9	4.1	8.6
198B--------------------- Floyd	90	2w	5.7	6.0	3.6	7.5
221---------------------- Klossner	100	3w	3.5	4.7	2.8	5.9
284B--------------------- Flagler	90	3e	3.4	3.3	1.9	4.1
285---------------------- Burkhardt	100	3s	2.2	2.1	1.3	2.6
285C--------------------- Burkhardt	100	3e	1.9	1.8	1.1	2.3
323B--------------------- Fort Dodge	85	2e	6.4	6.2	3.7	7.8
344D--------------------- Copaston	90	4s	2.6	2.5	1.5	3.1
344G--------------------- Copaston	85	6e	1.8	1.8	1.1	2.3
354---------------------- Aquolls, ponded	90	5w	---	1.6	---	2.0
377B--------------------- Dinsdale	90	2e	6.7	6.6	4.0	8.3
377C--------------------- Dinsdale	90	3e	6.5	6.4	3.8	8.0
382---------------------- Maxfield	100	2w	4.8	6.6	4.0	8.3
391B---------------------			4.8	5.9	3.5	7.4
Clyde-------------------	60	2w				
Floyd-------------------	35	2w				
394B--------------------- Ostrander	75	2e	6.5	6.3	3.8	7.9

See footnote at end of table.

Land Capability and Yields per Acre of Pasture--Continued

Map symbol and soil name	Pct. of map unit	Land capability	Bromegrass-alfalfa hay	Smooth bromegrass	Kentucky bluegrass	Bromegrass-alfalfa
			Tons	AUM*	AUM*	AUM*
394C: Ostrander	85	3e	6.3	6.1	3.7	7.6
395B: Marquis	80	2e	6.6	6.4	3.8	8.0
398: Tripoli	90	2w	4.8	6.3	3.8	7.9
399: Readlyn	85	1	6.1	6.5	3.9	8.1
408B: Olin	80	2e	5.5	5.4	3.2	6.8
471: Oran	85	1	6.0	6.1	3.7	7.6
485: Spillville, occasionally flooded	80	2w	5.7	6.2	3.7	7.8
582B: Kasson	90	2e	6.0	5.9	3.5	7.4
582C: Kasson	80	3e	5.8	5.7	3.4	7.1
585:			5.1	5.9	3.5	7.4
Spillville, occasionally flooded	50	2w				
Coland, occasionally flooded	30	2w				
620B: Port Byron	90	2e	7.0	6.8	4.1	8.5
620C2: Port Byron	100	3e	6.6	6.5	3.9	8.5
626: Hayfield, rarely flooded	90	2s	4.7	4.9	2.9	6.1
663B: Seaton	100	2e	6.3	6.1	3.7	7.6
663C: Seaton	100	3e	5.9	5.7	3.4	7.1
663D2: Seaton, moderately eroded	90	3e	5.5	5.4	3.2	6.8
663D3: Seaton, severely eroded	90	4e	5.3	5.2	3.1	6.5
663E2: Seaton, moderately eroded	90	4e	4.8	4.7	2.8	5.9

See footnote at end of table.

Land Capability and Yields per Acre of Pasture--Continued

Map symbol and soil name	Pct. of map unit	Land capability	Bromegrass-alfalfa hay	Smooth bromegrass	Kentucky bluegrass	Bromegrass-alfalfa
			Tons	AUM*	AUM*	AUM*
663G--------------------- Seaton	90	6e	4.1	4.0	2.4	5.0
775---------------------- Billett	100	2e	4.3	4.2	2.5	5.3
775B--------------------- Billett	100	2e	4.2	4.1	2.5	5.1
775C--------------------- Billett	100	3e	3.9	3.8	2.3	4.8
778---------------------- Sattre, rarely flooded	85	2s	5.1	5.0	3.0	6.3
813B--------------------- Atkinson	90	2e	5.8	5.7	3.4	7.1
813C--------------------- Atkinson	85	3e	5.3	5.1	3.1	6.4
814B--------------------- Rockton	90	2e	4.6	4.5	2.7	5.6
814C--------------------- Rockton	85	3e	4.2	4.1	2.5	5.1
814D--------------------- Rockton	90	4e	3.8	3.7	2.2	4.6
884---------------------- Klingmore	100	1	6.8	7.0	4.2	8.8
930---------------------- Orion, occasionally flooded	100	2w	5.4	5.2	3.1	6.5
982---------------------- Maxmore	100	2w	4.9	6.7	4.0	8.4
1152--------------------- Marshan, rarely flooded	75	2w	3.9	4.9	2.9	6.1
1226--------------------- Lawler, rarely flooded	80	2s	5.1	5.2	3.2	6.5
1585---------------------			0.9	1.2	0.7	1.5
Spillville, channeled---	40	5w				
Coland, channeled-------	35	5w				
Aquolls, ponded---------	15	5w				
1586---------------------			0.6	0.8	0.5	1.0
Sigglekov, frequently flooded----------------	55	5w				
Fluvaquents, frequently flooded----------------	30	7w				
Aquents, ponded---------	15	5w				

See footnote at end of table.

Land Capability and Yields per Acre of Pasture--Continued

Map symbol and soil name	Pct. of map unit	Land capability	Bromegrass-alfalfa hay	Smooth bromegrass	Kentucky bluegrass	Bromegrass-alfalfa
			Tons	AUM*	AUM*	AUM*
4946. Udorthents-Interstate highway						
5010. Pits, sand and gravel						
5030. Pits, limestone quarries						
5040. Udorthents, loamy						
5080. Udorthents, sanitary landfill						
8041--------------------- Sparta, terrace, rarely flooded	80	4s	3.7	3.6	2.2	6.2
8041B-------------------- Sparta, terrace, rarely flooded	80	4s	3.5	3.5	2.1	5.9
8175B-------------------- Dickinson, terrace, rarely flooded	100	3e	4.6	4.5	2.7	7.7
AW. Animal waste lagoon						
SL. Sewage lagoon						
W. Water						

* Animal unit month: The amount of forage required to feed one mature cow, of approximately 1,000 pounds weight, with or without a calf, for 30 days.

Prime Farmland and Other Important Farmland

The table “Prime Farmland and Other Important Farmland” lists the map units in the survey area that are considered prime farmland and farmland of statewide importance. This list does not constitute a recommendation for a particular land use.

In an effort to identify the extent and location of important farmlands, the Natural Resources Conservation Service, in cooperation with other interested Federal, State, and local government organizations, has inventoried land that can be used for the production of the Nation’s food supply.

Prime farmland is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation’s prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use in some areas has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

For some soils identified in the table as prime farmland, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures.

In some areas, land that does not meet the criteria for prime farmland is considered to be *farmland of statewide importance* for the production of food, feed, fiber, forage, and oilseed crops. The criteria for defining and delineating farmland of statewide importance are determined by the appropriate State agencies. Generally, this land includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some areas may produce as high a yield as prime farmland if conditions are favorable. Farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

Prime Farmland and Other Important Farmland

(Only the soils considered prime or important farmland are listed. Urban or built-up areas of the soils listed are not considered prime or important farmland. If a soil is prime or important farmland only under certain conditions, such as "where drained," those conditions are specified)

Map symbol	Map unit name	Farmland classification
41B	Sparta loamy fine sand, 2 to 5 percent slopes	Farmland of statewide importance
41C	Sparta loamy fine sand, 5 to 9 percent slopes	Farmland of statewide importance
43	Bremer silty clay loam, 0 to 2 percent slopes, rarely flooded	Prime farmland where drained
50B	Coloma loamy sand, 2 to 5 percent slopes, rarely flooded	Farmland of statewide importance
63B	Chelsea loamy fine sand, 2 to 5 percent slopes	Farmland of statewide importance
63C	Chelsea loamy fine sand, 5 to 9 percent slopes	Farmland of statewide importance
63E	Chelsea loamy fine sand, 9 to 18 percent slopes	Farmland of statewide importance
83B	Kenyon loam, 2 to 5 percent slopes	Prime farmland
83C	Kenyon loam, 5 to 9 percent slopes	Farmland of statewide importance
84	Clyde silty clay loam, 0 to 3 percent slopes	Prime farmland where drained
109B	Backbone sandy loam, 2 to 5 percent slopes	Farmland of statewide importance
109C	Backbone sandy loam, 5 to 9 percent slopes	Farmland of statewide importance
109D	Backbone sandy loam, 9 to 14 percent slopes	Farmland of statewide importance
127	Plano silty clay loam, 0 to 2 percent slopes, rarely flooded	Prime farmland
135	Coland clay loam, 0 to 2 percent slopes, occasionally flooded	Prime farmland where drained
153	Shandep loam, ponded, 0 to 1 percent slopes, occasionally flooded	Prime farmland where drained
173	Hoopeston sandy loam, terrace, 0 to 2 percent slopes, rarely flooded	Prime farmland
175B	Dickinson fine sandy loam, 2 to 5 percent slopes	Prime farmland
175C	Dickinson fine sandy loam, 5 to 9 percent slopes	Farmland of statewide importance
178	Waukee loam, 0 to 2 percent slopes, rarely flooded	Prime farmland
178B	Waukee loam, 2 to 5 percent slopes, rarely flooded	Prime farmland
178C	Waukee loam, 5 to 9 percent slopes, rarely flooded	Farmland of statewide importance
184	Klinger silty clay loam, 1 to 3 percent slopes	Prime farmland
198B	Floyd loam, 1 to 4 percent slopes	Prime farmland
221	Klossner muck, 1 to 3 percent slopes	Farmland of statewide importance
284B	Flagler sandy loam, 1 to 4 percent slopes, rarely flooded	Farmland of statewide importance
285	Burkhardt sandy loam, 0 to 2 percent slopes, rarely flooded	Farmland of statewide importance
285C	Burkhardt sandy loam, 2 to 9 percent slopes, rarely flooded	Farmland of statewide importance
323B	Fort Dodge loam, 1 to 4 percent slopes	Prime farmland
344D	Copaston loam, 5 to 14 percent slopes	Farmland of statewide importance
344G	Copaston loam, 14 to 30 percent slopes	Farmland of statewide importance
377B	Dinsdale silty clay loam, 2 to 5 percent slopes	Prime farmland
377C	Dinsdale silty clay loam, 5 to 9 percent slopes	Farmland of statewide importance
382	Maxfield silty clay loam, 0 to 2 percent slopes	Prime farmland where drained
391B	Clyde-Floyd complex, 1 to 4 percent slopes	Prime farmland where drained
394B	Ostrander loam, 2 to 5 percent slopes	Prime farmland
394C	Ostrander loam, 5 to 9 percent slopes	Farmland of statewide importance
395B	Marquis loam, 2 to 5 percent slopes	Prime farmland
398	Tripoli clay loam, 0 to 2 percent slopes	Prime farmland where drained
399	Readlyn loam, 1 to 3 percent slopes	Prime farmland
408B	Olin fine sandy loam, 2 to 5 percent slopes	Prime farmland
471	Oran loam, 1 to 3 percent slopes	Prime farmland
485	Spillville loam, 0 to 2 percent slopes, occasionally flooded	Prime farmland
582B	Kasson loam, 2 to 5 percent slopes	Prime farmland
582C	Kasson loam, 5 to 9 percent slopes	Farmland of statewide importance
585	Spillville-Coland complex, 0 to 2 percent slopes, occasionally flooded	Prime farmland where drained
620B	Port Byron silt loam, 2 to 5 percent slopes	Prime farmland
620C2	Port Byron silt loam, 5 to 9 percent slopes, moderately eroded	Farmland of statewide importance
626	Hayfield loam, 0 to 2 percent slopes, rarely flooded	Prime farmland
663B	Seaton silt loam, 2 to 5 percent slopes	Prime farmland
663C	Seaton silt loam, 5 to 9 percent slopes	Farmland of statewide importance

Prime Farmland and Other Important Farmland--Continued

Map symbol	Map unit name	Farmland classification
663D2	Seaton silt loam, 9 to 14 percent slopes, moderately eroded	Farmland of statewide importance
663D3	Seaton silt loam, 9 to 14 percent slopes, severely eroded	Farmland of statewide importance
663E2	Seaton silt loam, 14 to 18 percent slopes, moderately eroded	Farmland of statewide importance
663G	Seaton silt loam, 18 to 40 percent slopes	Farmland of statewide importance
775	Billett sandy loam, 0 to 2 percent slopes	Prime farmland
775B	Billett sandy loam, 2 to 5 percent slopes	Prime farmland
775C	Billett sandy loam, 5 to 9 percent slopes	Farmland of statewide importance
778	Sattre loam, 0 to 2 percent slopes, rarely flooded	Prime farmland
813B	Atkinson loam, 2 to 5 percent slopes	Prime farmland
813C	Atkinson loam, 5 to 9 percent slopes	Farmland of statewide importance
814B	Rockton loam, 2 to 5 percent slopes	Prime farmland
814C	Rockton loam, 5 to 9 percent slopes	Farmland of statewide importance
814D	Rockton loam, 9 to 14 percent slopes	Farmland of statewide importance
884	Klingmore silty clay loam, 1 to 3 percent slopes	Prime farmland
930	Orion silt loam, 0 to 2 percent slopes, occasionally flooded	Prime farmland
982	Maxmore silty clay loam, 0 to 2 percent slopes	Prime farmland where drained
1152	Marshan clay loam, 0 to 2 percent slopes, rarely flooded	Prime farmland where drained
1226	Lawler loam, 0 to 2 percent slopes, rarely flooded	Prime farmland
1585	Spillville, channeled-Coland, channeled-Aquolls, ponded, complex, 0 to 2 percent slopes, frequently flooded	Farmland of statewide importance
1586	Sigglekov-Fluvaquents, channeled-Aquents, ponded, complex, 0 to 2 percent slopes, frequently flooded	Farmland of statewide importance
8041	Sparta loamy sand, terrace, 0 to 2 percent slopes, rarely flooded	Farmland of statewide importance
8041B	Sparta loamy sand, terrace, 2 to 5 percent slopes, rarely flooded	Farmland of statewide importance
8175B	Dickinson fine sandy loam, terrace, 1 to 4 percent slopes, rarely flooded	Prime farmland

Agricultural Waste Management

The table “Agricultural Waste Management” is described in this section.

Soil properties are important considerations in areas where soils are used as sites for the treatment and disposal of organic waste and wastewater. Selection of soils with properties that favor waste management can help to prevent environmental damage.

This table shows the degree and kind of soil limitations affecting the treatment of agricultural waste, including municipal and food-processing wastewater and effluent from lagoons or storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Food-processing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places it is high in content of sodium and chloride. In the context of this table, the effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied, checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

The ratings in the table are for waste management systems that not only dispose of and treat organic waste or wastewater but also are beneficial to crops. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Application of manure and food-processing waste not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Manure is the excrement of livestock and poultry, and food-processing waste is damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. The manure and food-processing waste are solid, slurry, or liquid. Their nitrogen content varies. A high content of nitrogen limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with the lye used in food processing, are not considered in the ratings.

The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the waste is applied, and the method by which the waste is applied. The properties that affect absorption include permeability,

depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, and available water capacity. The properties that affect plant growth and microbial activity include reaction, the sodium adsorption ratio, salinity, and bulk density. The wind erodibility group, the soil erosion factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Application of sewage sludge not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. In the context of this table, sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant growth, and microbial activity include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available water capacity, reaction, salinity, and bulk density. The wind erodibility group, the soil erosion factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

Disposal of wastewater by irrigation not only disposes of municipal wastewater and wastewater from food-processing plants, lagoons, and storage ponds but also can improve crop production by increasing the amount of water available to crops. The ratings in the table are based on the soil properties that affect the design, construction, management, and performance of the irrigation system. The properties that affect design and management include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, slope, and flooding. The properties that affect construction include stones, cobbles, depth to bedrock or a cemented pan, depth to a water table, and ponding. The properties that affect performance include depth to bedrock or a cemented pan, bulk density, the sodium adsorption ratio, salinity, reaction, and the cation-exchange capacity, which is used to estimate the capacity of a soil to adsorb heavy metals. Permanently frozen soils are not suitable for disposal of wastewater by irrigation.

A soil feature considered in the ratings for application of manure, sewage sludge, and wastewater is depth to the top of a water table (saturated zone). During August, September, and October, this depth is generally more than 60 cm in normal years. For soils that are limited by wetness, “Nov-Jul” indicates the most problematic months of the year for application of manure, sewage sludge, and wastewater. These soils may be slow to drain and can become waterlogged and boggy during periods of heavy precipitation.

Agricultural Waste Management

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste: Rating class and limiting features	Value	Application of sewage sludge: Rating class and limiting features	Value	Disposal of wastewater by irrigation: Rating class and limiting features	Value
41B:							
Sparta	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Leaching	0.45	Too acid	0.07	Too steep for surface application	0.08
		Too acid	0.02			Too acid	0.07
41C:							
Sparta	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Leaching	0.45	Too acid	0.07	Too steep for surface application	0.92
		Too acid	0.02			Too acid	0.07
						Too steep for sprinkler application	0.02
43:							
Bremer	100	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
				Flooding	0.40		
50B:							
Coloma	85	Somewhat limited		Somewhat limited		Somewhat limited	
		Leaching	0.45	Too acid	0.67	Too acid	0.67
		Droughty	0.24	Flooding	0.40	Droughty	0.24
		Too acid	0.18	Droughty	0.24		
63B:							
Chelsea	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Leaching	0.45	Droughty	0.06	Too steep for surface application	0.08
		Droughty	0.06			Droughty	0.06
63C:							
Chelsea	85	Somewhat limited		Somewhat limited		Somewhat limited	
		Leaching	0.45	Droughty	0.06	Too steep for surface application	0.92
		Droughty	0.06			Droughty	0.06
						Too steep for sprinkler application	0.02

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste: Rating class and limiting features	Value	Application of sewage sludge: Rating class and limiting features	Value	Disposal of wastewater by irrigation: Rating class and limiting features	Value
63E:							
Chelsea	85	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Too steep for surface application	1.00
		Leaching	0.45	Droughty	0.06	Too steep for sprinkler application	1.00
		Droughty	0.06			Droughty	0.06
83B:							
Kenyon	75	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Dense layer	1.00				
83C:							
Kenyon	75	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Dense layer	1.00			Too steep for surface application	0.92
						Too steep for sprinkler application	0.02
84:							
Clyde	80	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Leaching	0.70				
109B:							
Backbone	100	Somewhat limited		Somewhat limited		Somewhat limited	
		Droughty	0.84	Droughty	0.84	Droughty	0.84
		Depth to bedrock	0.46	Depth to bedrock	0.46	Depth to bedrock	0.46
						Too steep for surface application	0.08
109C:							
Backbone	100	Somewhat limited		Somewhat limited		Somewhat limited	
		Droughty	0.84	Droughty	0.84	Too steep for surface application	0.92
		Depth to bedrock	0.46	Depth to bedrock	0.46	Droughty	0.84
						Depth to bedrock	0.46

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste: Rating class and limiting features	Value	Application of sewage sludge: Rating class and limiting features	Value	Disposal of wastewater by irrigation: Rating class and limiting features	Value
109D:							
Backbone	100	Somewhat limited		Somewhat limited		Very limited	
		Droughty	0.84	Droughty	0.84	Too steep for surface application	1.00
		Slope	0.63	Slope	0.63	Droughty	0.84
		Depth to bedrock	0.46	Depth to bedrock	0.46	Too steep for sprinkler application	0.78
127:							
Plano, rarely flooded	85	Not limited		Somewhat limited		Not limited	
				Flooding	0.40		
135:							
Coland, occasionally flooded	85	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Leaching	0.70	Flooding	1.00	Flooding	0.60
		Flooding	0.60				
153:							
Shandep, ponded, occasionally flooded	75	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Leaching	0.70	Flooding	0.40		
173:							
Hoopeston, rarely flooded	100	Very limited		Very limited		Very limited	
		Filtering capacity	1.00	Filtering capacity	1.00	Filtering capacity	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Too acid	0.02	Flooding	0.40	Too acid	0.07
175B:							
Dickinson	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Leaching	0.45	Droughty	0.05	Too steep for surface application	0.08
		Droughty	0.05			Droughty	0.05
175C:							
Dickinson	100	Somewhat limited		Somewhat limited		Somewhat limited	
		Leaching	0.45	Droughty	0.05	Too steep for surface application	0.92
		Droughty	0.05			Droughty	0.05
						Too steep for sprinkler application	0.02

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste: Rating class and limiting features	Value	Application of sewage sludge: Rating class and limiting features	Value	Disposal of wastewater by irrigation: Rating class and limiting features	Value
178:							
Waukee, rarely flooded-----------	85	Somewhat limited		Somewhat limited		Somewhat limited	
		Too acid	0.03	Flooding	0.40	Too acid	0.14
				Too acid	0.14		
178B:							
Waukee, rarely flooded-----------	95	Somewhat limited		Somewhat limited		Somewhat limited	
		Too acid	0.03	Flooding	0.40	Too acid	0.14
				Too acid	0.14	Too steep for surface application	0.08
178C:							
Waukee, rarely flooded-----------	95	Somewhat limited		Somewhat limited		Somewhat limited	
		Too acid	0.03	Flooding	0.40	Too steep for surface application	0.92
				Too acid	0.14	Too acid	0.14
						Too steep for sprinkler application	0.02
184:							
Klinger-------------	100	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Too acid	0.02	Too acid	0.07	Too acid	0.07
198B:							
Floyd---------------	90	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
221:							
Klossner------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Leaching	0.90	Too acid	0.07	Too acid	0.07
		Too acid	0.02				
284B:							
Flagler-------------	90	Very limited		Very limited		Very limited	
		Filtering capacity	1.00	Filtering capacity	1.00	Filtering capacity	1.00
		Leaching	0.45	Flooding	0.40	Droughty	0.13
		Droughty	0.13	Droughty	0.13		

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste: Rating class and limiting features	Value	Application of sewage sludge: Rating class and limiting features	Value	Disposal of wastewater by irrigation: Rating class and limiting features	Value
285:							
Burkhardt-----------	100	Somewhat limited		Somewhat limited		Somewhat limited	
		Droughty	0.91	Droughty	0.91	Droughty	0.91
		Leaching	0.45	Flooding	0.40	Too acid	0.07
		Too acid	0.02	Too acid	0.07		
285C:							
Burkhardt-----------	100	Somewhat limited		Somewhat limited		Somewhat limited	
		Droughty	0.91	Droughty	0.91	Droughty	0.91
		Leaching	0.45	Flooding	0.40	Too steep for surface application	0.32
		Too acid	0.02	Too acid	0.07	Too acid	0.07
323B:							
Fort Dodge----------	85	Not limited		Not limited		Not limited	
344D:							
Copaston------------	90	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Droughty	1.00	Droughty	1.00	Droughty	1.00
		Runoff	0.40	Slope	0.04	Too steep for surface application	1.00
344G:							
Copaston------------	85	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Too steep for surface application	1.00
		Droughty	1.00	Droughty	1.00	Depth to bedrock	1.00
		Slope	1.00	Slope	1.00	Droughty	1.00
354:							
Aquolls, ponded-----	90	Not rated		Not rated		Not rated	
377B:							
Dinsdale------------	90	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Too acid	0.02	Too acid	0.07	Too acid	0.07
377C:							
Dinsdale------------	90	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Too acid	0.02	Too acid	0.07	Too steep for surface application	0.92
						Too acid	0.07
382:							
Maxfield------------	100	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Leaching	0.70				

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste: Rating class and limiting features	Value	Application of sewage sludge: Rating class and limiting features	Value	Disposal of wastewater by irrigation: Rating class and limiting features	Value
391B:							
Clyde	60	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Leaching	0.70				
Floyd	35	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
394B:							
Ostrander	75	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
						Too steep for surface application	0.08
394C:							
Ostrander	85	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
						Too steep for surface application	0.68
395B:							
Marquis	80	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
398:							
Tripoli	90	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Leaching	0.70				
399:							
Readlyn	85	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Too acid	0.02	Too acid	0.07	Too acid	0.07

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste: Rating class and limiting features	Value	Application of sewage sludge: Rating class and limiting features	Value	Disposal of wastewater by irrigation: Rating class and limiting features	Value
408B:							
Olin	80	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
						Too steep for surface application	0.08
471:							
Oran	85	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Dense layer	1.00	Too acid	0.07	Too acid	0.07
485:							
Spillville, occasionally flooded	80	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Flooding	0.60	Flooding	1.00	Flooding	0.60
582B:							
Kasson	90	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Dense layer	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Too acid	0.07	Too steep for surface application	0.08
582C:							
Kasson	80	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Dense layer	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Too acid	0.07	Too steep for surface application	0.92
585:							
Spillville, occasionally flooded	50	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Flooding	0.60	Flooding	1.00	Flooding	0.60

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste: Rating class and limiting features	Value	Application of sewage sludge: Rating class and limiting features	Value	Disposal of wastewater by irrigation: Rating class and limiting features	Value
585:							
Coland, occasionally flooded	30	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Leaching	0.70	Flooding	1.00	Flooding	0.60
		Flooding	0.60				
620B:							
Port Byron	90	Not limited		Not limited		Somewhat limited	
						Too steep for surface application	0.08
620C2:							
Port Byron	100	Not limited		Not limited		Somewhat limited	
						Too steep for surface application	0.92
						Too steep for sprinkler application	0.02
626:							
Hayfield, rarely flooded	90	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
				Flooding	0.40		
663B:							
Seaton	100	Not limited		Not limited		Not limited	
663C:							
Seaton	100	Not limited		Not limited		Somewhat limited	
						Too steep for surface application	0.92
						Too steep for sprinkler application	0.02
663D2:							
Seaton, moderately eroded	90	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.63	Slope	0.63	Too steep for surface application	1.00
						Too steep for sprinkler application	0.78

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste: Rating class and limiting features	Value	Application of sewage sludge: Rating class and limiting features	Value	Disposal of wastewater by irrigation: Rating class and limiting features	Value
663D3:							
Seaton, severely eroded	90	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.63	Slope	0.63	Too steep for surface application	1.00
						Too steep for sprinkler application	0.78
663E2:							
Seaton, moderately eroded	90	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Too steep for surface application	1.00
						Too steep for sprinkler application	1.00
663G:							
Seaton	90	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Too steep for sprinkler application	1.00
						Too steep for surface application	1.00
775:							
Billett	100	Very limited		Very limited		Very limited	
		Filtering capacity	1.00	Filtering capacity	1.00	Filtering capacity	1.00
		Leaching	0.45	Too acid	0.07	Too acid	0.07
		Too acid	0.02				
775B:							
Billett	100	Very limited		Very limited		Very limited	
		Filtering capacity	1.00	Filtering capacity	1.00	Filtering capacity	1.00
		Leaching	0.45	Too acid	0.07	Too steep for surface application	0.08
		Too acid	0.02			Too acid	0.07
775C:							
Billett	100	Very limited		Very limited		Very limited	
		Filtering capacity	1.00	Filtering capacity	1.00	Filtering capacity	1.00
		Leaching	0.45	Too acid	0.07	Too steep for surface application	0.92
		Too acid	0.02			Too acid	0.07
778:							
Sattre, rarely flooded	85	Somewhat limited		Somewhat limited		Somewhat limited	
		Too acid	0.01	Flooding	0.40	Too acid	0.03
				Too acid	0.03		

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste: Rating class and limiting features	Value	Application of sewage sludge: Rating class and limiting features	Value	Disposal of wastewater by irrigation: Rating class and limiting features	Value
813B:							
Atkinson	90	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Too acid	0.03	Too acid	0.14	Too acid	0.14
813C:							
Atkinson	85	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Too acid	0.03	Too acid	0.14	Too steep for surface application	0.92
						Too acid	0.14
814B:							
Rockton	90	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to bedrock	0.35	Depth to bedrock	0.35	Depth to bedrock	0.35
		Too acid	0.02	Too acid	0.07	Too acid	0.07
814C:							
Rockton	85	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to bedrock	0.35	Depth to bedrock	0.35	Too steep for surface application	0.92
		Too acid	0.02	Too acid	0.07	Depth to bedrock	0.35
814D:							
Rockton	90	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Slope	0.63	Slope	0.63	Too steep for surface application	1.00
		Depth to bedrock	0.35	Depth to bedrock	0.35	Too steep for sprinkler application	0.78
884:							
Klingmore	100	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Too acid	0.02	Too acid	0.07	Too acid	0.07
930:							
Orion, occasionally flooded	100	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Flooding	0.60	Flooding	1.00	Flooding	0.60

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste: Rating class and limiting features	Value	Application of sewage sludge: Rating class and limiting features	Value	Disposal of wastewater by irrigation: Rating class and limiting features	Value
982:							
Maxmore	100	Very limited		Very limited		Very limited	
		Slow water movement	1.00	Slow water movement	1.00	Slow water movement	1.00
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Leaching	0.70				
1152:							
Marshan, rarely flooded	75	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Leaching	0.70	Flooding	0.40		
1226:							
Lawler, rarely flooded	80	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
				Flooding	0.40		
1585:							
Spillville, channeled	40	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Flooding	1.00	Flooding	1.00	Flooding	1.00
Coland, channeled	35	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Leaching	0.70				
Aquolls, ponded	15	Not rated		Not rated		Not rated	
1586:							
Sigglekov, frequently flooded	55	Very limited		Very limited		Very limited	
		Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00	Depth to saturated zone (Nov-Jul)	1.00
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Droughty	0.96	Droughty	0.96	Droughty	0.96
Fluvaquents, frequently flooded	30	Not rated		Not rated		Not rated	
Aquents, ponded	15	Not rated		Not rated		Not rated	
4946:							
Udorthents	65	Not rated		Not rated		Not rated	
Interstate highway	35	Not rated		Not rated		Not rated	

Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste		Application of sewage sludge		Disposal of wastewater by irrigation	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
5010:							
Pits, sand and gravel	100	Not rated		Not rated		Not rated	
5030:							
Pits, limestone quarries	100	Not rated		Not rated		Not rated	
5040:							
Udorthents, loamy	100	Not rated		Not rated		Not rated	
5080:							
Udorthents, sanitary landfill	100	Not rated		Not rated		Not rated	
8041:							
Sparta, terrace, rarely flooded	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Leaching	0.45	Flooding	0.40	Too acid	0.07
		Too acid	0.02	Too acid	0.07		
8041B:							
Sparta, terrace, rarely flooded	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Leaching	0.45	Flooding	0.40	Too acid	0.07
		Too acid	0.02	Too acid	0.07		
8175B:							
Dickinson, terrace, rarely flooded	100	Very limited		Very limited		Very limited	
		Filtering capacity	1.00	Filtering capacity	1.00	Filtering capacity	1.00
		Leaching	0.45	Flooding	0.40	Too steep for surface application	0.08
		Droughty	0.05	Droughty	0.05	Droughty	0.05
AW:							
Animal waste lagoon	100	Not rated		Not rated		Not rated	
SL:							
Sewage lagoon	100	Not rated		Not rated		Not rated	
W:							
Water	100	Not rated		Not rated		Not rated	

Recreational Development

The titles of the tables described in this section are:

- “Camp Areas, Picnic Areas, and Playgrounds”
- “Paths, Trails, and Golf Fairways”

In the tables described in this section, the soils of the survey area are rated according to limitations that affect their suitability for recreational development. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings in the tables are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

The information in these tables can be supplemented by other information in this survey, for example, interpretations for dwellings without basements, for local roads and streets, and for septic tank absorption fields.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and

not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Playgrounds require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

Off-road motorcycle trails require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to a water table, ponding, flooding, and texture of the surface layer.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

Camp Areas, Picnic Areas, and Playgrounds

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Camp areas		Picnic areas		Playgrounds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
41B:							
Sparta--------------	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.95	Too sandy	0.95	Too sandy	0.95
						Slope	0.50
						Gravel content	0.22
41C:							
Sparta--------------	80	Somewhat limited		Somewhat limited		Very limited	
		Too sandy	0.95	Too sandy	0.95	Slope	1.00
						Too sandy	0.95
						Gravel content	0.22
43:							
Bremer--------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00				
50B:							
Coloma--------------	85	Very limited		Somewhat limited		Somewhat limited	
		Flooding	1.00	Too sandy	0.88	Too sandy	0.88
		Too sandy	0.88			Slope	0.12
63B:							
Chelsea-------------	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.95	Too sandy	0.95	Too sandy	0.95
						Slope	0.50
63C:							
Chelsea-------------	85	Somewhat limited		Somewhat limited		Very limited	
		Too sandy	0.95	Too sandy	0.95	Slope	1.00
						Too sandy	0.95
63E:							
Chelsea-------------	85	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Too sandy	0.95	Too sandy	0.95	Too sandy	0.95
83B:							
Kenyon--------------	75	Somewhat limited		Somewhat limited		Somewhat limited	
		Slow water movement	0.99	Slow water movement	0.99	Slow water movement	0.99
						Slope	0.12
83C:							
Kenyon--------------	75	Somewhat limited		Somewhat limited		Very limited	
		Slow water movement	0.99	Slow water movement	0.99	Slope	1.00
						Slow water movement	0.99
84:							
Clyde---------------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas		Picnic areas		Playgrounds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
109B:							
Backbone-----------	100	Not limited		Not limited		Somewhat limited	
						Slope	0.50
						Depth to bedrock	0.46
109C:							
Backbone-----------	100	Not limited		Not limited		Very limited	
						Slope	1.00
						Depth to bedrock	0.46
109D:							
Backbone-----------	100	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.63	Slope	0.63	Slope	1.00
						Depth to bedrock	0.46
127:							
Plano, rarely flooded-----------	85	Very limited		Not limited		Not limited	
		Flooding	1.00				
135:							
Coland, occasionally flooded-----------	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00			Flooding	0.60
153:							
Shandep, ponded, occasionally flooded-----------	75	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00	Ponding	1.00	Ponding	1.00
		Ponding	1.00				
173:							
Hoopeston, rarely flooded-----------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00				
175B:							
Dickinson----------	90	Not limited		Not limited		Somewhat limited	
						Slope	0.50
175C:							
Dickinson----------	100	Not limited		Not limited		Very limited	
						Slope	1.00
178:							
Waukee, rarely flooded-----------	85	Very limited		Not limited		Not limited	
		Flooding	1.00				
178B:							
Waukee, rarely flooded-----------	95	Very limited		Not limited		Somewhat limited	
		Flooding	1.00			Slope	0.50

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas: Rating class and limiting features	Camp areas: Value	Picnic areas: Rating class and limiting features	Picnic areas: Value	Playgrounds: Rating class and limiting features	Playgrounds: Value
178C:							
Waukee, rarely flooded	95	Very limited		Not limited		Very limited	
		Flooding	1.00			Slope	1.00
184:							
Klinger	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.99	Slow water movement	0.99	Slow water movement	0.99
198B:							
Floyd	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
						Slope	0.12
221:							
Klossner	100	Not rated		Not rated		Not rated	
284B:							
Flagler	90	Very limited		Not limited		Somewhat limited	
		Flooding	1.00			Gravel content	0.04
285:							
Burkhardt	100	Very limited		Not limited		Not limited	
		Flooding	1.00				
285C:							
Burkhardt	100	Very limited		Not limited		Somewhat limited	
		Flooding	1.00			Slope	0.88
323B:							
Fort Dodge	85	Not limited		Not limited		Not limited	
344D:							
Copaston	90	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Slope	0.04	Slope	0.04	Slope	1.00
						Gravel content	0.27
344G:							
Copaston	85	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
						Gravel content	0.27
354:							
Aquolls, ponded	90	Not rated		Not rated		Not rated	
377B:							
Dinsdale	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Slow water movement	0.99	Slow water movement	0.99	Slow water movement	0.99
						Slope	0.12

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas: Rating class and limiting features	Camp areas: Value	Picnic areas: Rating class and limiting features	Picnic areas: Value	Playgrounds: Rating class and limiting features	Playgrounds: Value
377C:							
Dinsdale------------	90	Somewhat limited		Somewhat limited		Very limited	
		Slow water movement	0.99	Slow water movement	0.99	Slope	1.00
						Slow water movement	0.99
382:							
Maxfield------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.99	Slow water movement	0.99	Slow water movement	0.99
391B:							
Clyde---------------	60	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
Floyd---------------	35	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
						Slope	0.12
394B:							
Ostrander-----------	75	Somewhat limited		Somewhat limited		Somewhat limited	
		Slow water movement	0.99	Slow water movement	0.99	Slow water movement	0.99
						Slope	0.50
394C:							
Ostrander-----------	85	Somewhat limited		Somewhat limited		Very limited	
		Slow water movement	0.99	Slow water movement	0.99	Slope	1.00
						Slow water movement	0.99
395B:							
Marquis-------------	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Slow water movement	0.99	Slow water movement	0.99	Slow water movement	0.99
		Depth to saturated zone	0.39	Depth to saturated zone	0.19	Depth to saturated zone	0.39
						Slope	0.12
398:							
Tripoli-------------	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.99	Slow water movement	0.99	Slow water movement	0.99
399:							
Readlyn-------------	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.99	Slow water movement	0.99	Slow water movement	0.99

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas: Rating class and limiting features	Camp areas: Value	Picnic areas: Rating class and limiting features	Picnic areas: Value	Playgrounds: Rating class and limiting features	Playgrounds: Value
408B:							
Olin	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Slow water movement	0.99	Slow water movement	0.99	Slow water movement	0.99
						Slope	0.50
471:							
Oran	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.99	Slow water movement	0.99	Slow water movement	0.99
485:							
Spillville, occasionally flooded	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00			Flooding	0.60
582B:							
Kasson	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Slow water movement	0.99	Slow water movement	0.99	Slow water movement	0.99
		Depth to saturated zone	0.39	Depth to saturated zone	0.19	Slope	0.50
						Depth to saturated zone	0.39
582C:							
Kasson	80	Somewhat limited		Somewhat limited		Very limited	
		Slow water movement	0.99	Slow water movement	0.99	Slope	1.00
		Depth to saturated zone	0.39	Depth to saturated zone	0.19	Slow water movement	0.99
						Depth to saturated zone	0.39
585:							
Spillville, occasionally flooded	50	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00			Flooding	0.60
Coland, occasionally flooded	30	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00			Flooding	0.60
620B:							
Port Byron	90	Not limited		Not limited		Somewhat limited	
						Slope	0.50
620C2:							
Port Byron	100	Not limited		Not limited		Very limited	
						Slope	1.00

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas		Picnic areas		Playgrounds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
626:							
Hayfield, rarely flooded-----------	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00				
663B:							
Seaton--------------	100	Not limited		Not limited		Somewhat limited	
						Slope	0.12
663C:							
Seaton--------------	100	Not limited		Not limited		Very limited	
						Slope	1.00
663D2:							
Seaton, moderately eroded------------	90	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.63	Slope	0.63	Slope	1.00
663D3:							
Seaton, severely eroded------------	90	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.63	Slope	0.63	Slope	1.00
663E2:							
Seaton, moderately eroded------------	90	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
663G:							
Seaton--------------	90	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
775:							
Billett-------------	100	Not limited		Not limited		Not limited	
775B:							
Billett-------------	100	Not limited		Not limited		Somewhat limited	
						Slope	0.50
775C:							
Billett-------------	100	Not limited		Not limited		Very limited	
						Slope	1.00
778:							
Sattre, rarely flooded-----------	85	Very limited		Not limited		Not limited	
		Flooding	1.00				
813B:							
Atkinson-----------	90	Not limited		Not limited		Somewhat limited	
						Slope	0.12
813C:							
Atkinson-----------	85	Not limited		Not limited		Very limited	
						Slope	1.00

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas		Picnic areas		Playgrounds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
814B:							
Rockton-------------	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Slow water movement	0.99	Slow water movement	0.99	Slow water movement	0.99
						Depth to bedrock	0.35
						Slope	0.12
814C:							
Rockton-------------	85	Somewhat limited		Somewhat limited		Very limited	
		Slow water movement	0.99	Slow water movement	0.99	Slope	1.00
						Slow water movement	0.99
						Depth to bedrock	0.35
814D:							
Rockton-------------	90	Somewhat limited		Somewhat limited		Very limited	
		Slow water movement	0.99	Slow water movement	0.99	Slope	1.00
		Slope	0.63	Slope	0.63	Slow water movement	0.99
						Depth to bedrock	0.35
884:							
Klingmore-----------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
930:							
Orion, occasionally flooded------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00			Flooding	0.60
982:							
Maxmore-------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
1152:							
Marshan, rarely flooded------------	75	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00				
1226:							
Lawler, rarely flooded------------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00				
1585:							
Spillville, channeled----------	40	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00	Flooding	0.40	Flooding	1.00

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas		Picnic areas		Playgrounds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1585:							
Coland, channeled	35	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00	Flooding	0.40	Flooding	1.00
Aquolls, ponded	15	Not rated		Not rated		Not rated	
1586:							
Sigglekov, frequently flooded	55	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00	Flooding	0.40	Flooding	1.00
Fluvaquents, frequently flooded	30	Not rated		Not rated		Not rated	
Aquents, ponded	15	Not rated		Not rated		Not rated	
4946:							
Udorthents	65	Not rated		Not rated		Not rated	
Interstate highway	35	Not rated		Not rated		Not rated	
5010:							
Pits, sand and gravel	100	Not rated		Not rated		Not rated	
5030:							
Pits, limestone quarries	100	Not rated		Not rated		Not rated	
5040:							
Udorthents, loamy	100	Not rated		Not rated		Not rated	
5080:							
Udorthents, sanitary landfill	100	Not rated		Not rated		Not rated	
8041:							
Sparta, terrace, rarely flooded	80	Very limited		Somewhat limited		Somewhat limited	
		Flooding	1.00	Too sandy	0.95	Too sandy	0.95
		Too sandy	0.95			Gravel content	0.22
8041B:							
Sparta, terrace, rarely flooded	80	Very limited		Somewhat limited		Somewhat limited	
		Flooding	1.00	Too sandy	0.95	Too sandy	0.95
		Too sandy	0.95			Gravel content	0.22
						Slope	0.12
8175B:							
Dickinson, terrace, rarely flooded	100	Very limited		Not limited		Somewhat limited	
		Flooding	1.00			Slope	0.50

Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	Camp areas		Picnic areas		Playgrounds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
AW:							
Animal waste lagoon	100	Not rated		Not rated		Not rated	
SL:							
Sewage lagoon-------	100	Not rated		Not rated		Not rated	
W:							
Water---------------	100	Not rated		Not rated		Not rated	

Paths, Trails, and Golf Fairways

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Paths and trails		Off-road motorcycle trails		Golf fairways	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
41B:							
Sparta	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.95	Too sandy	0.95	Droughty	0.07
41C:							
Sparta	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.95	Too sandy	0.95	Droughty	0.07
43:							
Bremer	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
50B:							
Coloma	85	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.88	Too sandy	0.88	Droughty	0.89
63B:							
Chelsea	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.95	Too sandy	0.95	Droughty	0.28
63C:							
Chelsea	85	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.95	Too sandy	0.95	Droughty	0.28
63E:							
Chelsea	85	Somewhat limited		Somewhat limited		Very limited	
		Too sandy	0.95	Too sandy	0.95	Slope	1.00
		Slope	0.02			Droughty	0.28
83B:							
Kenyon	75	Not limited		Not limited		Not limited	
83C:							
Kenyon	75	Not limited		Not limited		Not limited	
84:							
Clyde	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
109B:							
Backbone	100	Not limited		Not limited		Somewhat limited	
						Depth to bedrock	0.46
						Droughty	0.02
109C:							
Backbone	100	Not limited		Not limited		Somewhat limited	
						Depth to bedrock	0.46
						Droughty	0.02

Paths, Trails, and Golf Fairways--Continued

Map symbol and soil name	Pct. of map unit	Paths and trails		Off-road motorcycle trails		Golf fairways	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
109D:							
Backbone------------	100	Not limited		Not limited		Somewhat limited	
						Slope	0.63
						Depth to bedrock	0.46
						Droughty	0.02
127:							
Plano, rarely flooded------------	85	Not limited		Not limited		Not limited	
135:							
Coland, occasionally flooded------------	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
						Flooding	0.60
153:							
Shandep, ponded, occasionally flooded------------	75	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Ponding	1.00	Ponding	1.00	Ponding	1.00
173:							
Hoopeston, rarely flooded------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
175B:							
Dickinson-----------	90	Not limited		Not limited		Not limited	
175C:							
Dickinson-----------	100	Not limited		Not limited		Not limited	
178:							
Waukee, rarely flooded------------	85	Not limited		Not limited		Not limited	
178B:							
Waukee, rarely flooded------------	95	Not limited		Not limited		Not limited	
178C:							
Waukee, rarely flooded------------	95	Not limited		Not limited		Not limited	
184:							
Klinger-------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
198B:							
Floyd---------------	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00

Paths, Trails, and Golf Fairways--Continued

Map symbol and soil name	Pct. of map unit	Paths and trails: Rating class and limiting features	Value	Off-road motorcycle trails: Rating class and limiting features	Value	Golf fairways: Rating class and limiting features	Value
221:							
Klossner	100	Not rated		Not rated		Very limited	
						Depth to saturated zone	1.00
284B:							
Flagler	90	Not limited		Not limited		Not limited	
285:							
Burkhardt	100	Not limited		Not limited		Somewhat limited	
						Droughty	0.52
285C:							
Burkhardt	100	Not limited		Not limited		Somewhat limited	
						Droughty	0.52
323B:							
Fort Dodge	85	Not limited		Not limited		Not limited	
344D:							
Copaston	90	Not limited		Not limited		Very limited	
						Depth to bedrock	1.00
						Droughty	0.57
						Slope	0.04
344G:							
Copaston	85	Somewhat limited		Not limited		Very limited	
		Slope	0.50			Depth to bedrock	1.00
						Slope	1.00
						Droughty	0.57
354:							
Aquolls, ponded	90	Not rated		Not rated		Not rated	
377B:							
Dinsdale	90	Not limited		Not limited		Not limited	
377C:							
Dinsdale	90	Not limited		Not limited		Not limited	
382:							
Maxfield	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
391B:							
Clyde	60	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
Floyd	35	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
394B:							
Ostrander	75	Not limited		Not limited		Not limited	
394C:							
Ostrander	85	Not limited		Not limited		Not limited	

Paths, Trails, and Golf Fairways--Continued

Map symbol and soil name	Pct. of map unit	Paths and trails: Rating class and limiting features	Value	Off-road motorcycle trails: Rating class and limiting features	Value	Golf fairways: Rating class and limiting features	Value
395B:							
Marquis	80	Not limited		Not limited		Somewhat limited	
						Depth to saturated zone	0.19
398:							
Tripoli	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
399:							
Readlyn	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
408B:							
Olin	80	Not limited		Not limited		Not limited	
471:							
Oran	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
485:							
Spillville, occasionally flooded	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
						Flooding	0.60
582B:							
Kasson	90	Not limited		Not limited		Somewhat limited	
						Depth to saturated zone	0.19
582C:							
Kasson	80	Not limited		Not limited		Somewhat limited	
						Depth to saturated zone	0.19
585:							
Spillville, occasionally flooded	50	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
						Flooding	0.60
Coland, occasionally flooded	30	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
						Flooding	0.60
620B:							
Port Byron	90	Not limited		Not limited		Not limited	

Paths, Trails, and Golf Fairways--Continued

Map symbol and soil name	Pct. of map unit	Paths and trails: Rating class and limiting features	Value	Off-road motorcycle trails: Rating class and limiting features	Value	Golf fairways: Rating class and limiting features	Value
620C2:							
Port Byron----------	100	Not limited		Not limited		Not limited	
626:							
Hayfield, rarely flooded-----------	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
663B:							
Seaton--------------	100	Not limited		Not limited		Not limited	
663C:							
Seaton--------------	100	Not limited		Not limited		Not limited	
663D2:							
Seaton, moderately eroded------------	90	Very limited		Very limited		Somewhat limited	
		Water erosion	1.00	Water erosion	1.00	Slope	0.63
663D3:							
Seaton, severely eroded------------	90	Very limited		Very limited		Somewhat limited	
		Water erosion	1.00	Water erosion	1.00	Slope	0.63
663E2:							
Seaton, moderately eroded------------	90	Very limited		Very limited		Very limited	
		Water erosion	1.00	Water erosion	1.00	Slope	1.00
		Slope	0.02				
663G:							
Seaton--------------	90	Very limited		Very limited		Very limited	
		Water erosion	1.00	Water erosion	1.00	Slope	1.00
		Slope	1.00				
775:							
Billett-------------	100	Not limited		Not limited		Not limited	
775B:							
Billett-------------	100	Not limited		Not limited		Not limited	
775C:							
Billett-------------	100	Not limited		Not limited		Not limited	
778:							
Sattre, rarely flooded-----------	85	Not limited		Not limited		Not limited	
813B:							
Atkinson-----------	90	Not limited		Not limited		Not limited	
813C:							
Atkinson-----------	85	Not limited		Not limited		Not limited	
814B:							
Rockton-------------	90	Not limited		Not limited		Somewhat limited	
						Depth to bedrock	0.35

Paths, Trails, and Golf Fairways--Continued

Map symbol and soil name	Pct. of map unit	Paths and trails: Rating class and limiting features	Value	Off-road motorcycle trails: Rating class and limiting features	Value	Golf fairways: Rating class and limiting features	Value
814C:							
Rockton-------------	85	Not limited		Not limited		Somewhat limited	
						Depth to bedrock	0.35
814D:							
Rockton-------------	90	Not limited		Not limited		Somewhat limited	
						Slope	0.63
						Depth to bedrock	0.35
884:							
Klingmore-----------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
930:							
Orion, occasionally flooded------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
						Flooding	0.60
982:							
Maxmore-------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
1152:							
Marshan, rarely flooded------------	75	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
1226:							
Lawler, rarely flooded------------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
1585:							
Spillville, channeled----------	40	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Flooding	1.00
		Flooding	0.40	Flooding	0.40	Depth to saturated zone	1.00
Coland, channeled---	35	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Flooding	1.00
		Flooding	0.40	Flooding	0.40	Depth to saturated zone	1.00
Aquolls, ponded-----	15	Not rated		Not rated		Not rated	
1586:							
Sigglekov, frequently flooded	55	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Flooding	1.00
		Flooding	0.40	Flooding	0.40	Depth to saturated zone	1.00
						Droughty	0.98

Paths, Trails, and Golf Fairways--Continued

Map symbol and soil name	Pct. of map unit	Paths and trails: Rating class and limiting features	Value	Off-road motorcycle trails: Rating class and limiting features	Value	Golf fairways: Rating class and limiting features	Value
1586:							
Fluvaquents, frequently flooded	30	Not rated		Not rated		Not rated	
Aquents, ponded-----	15	Not rated		Not rated		Not rated	
4946:							
Udorthents----------	65	Not rated		Not rated		Not rated	
Interstate highway--	35	Not rated		Not rated		Not rated	
5010:							
Pits, sand and gravel-------------	100	Not rated		Not rated		Not rated	
5030:							
Pits, limestone quarries-----------	100	Not rated		Not rated		Not rated	
5040:							
Udorthents, loamy---	100	Not rated		Not rated		Not rated	
5080:							
Udorthents, sanitary landfill-----------	100	Not rated		Not rated		Not rated	
8041:							
Sparta, terrace, rarely flooded-----	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.95	Too sandy	0.95	Droughty	0.07
8041B:							
Sparta, terrace, rarely flooded-----	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.95	Too sandy	0.95	Droughty	0.07
8175B:							
Dickinson, terrace, rarely flooded-----	100	Not limited		Not limited		Not limited	
AW:							
Animal waste lagoon	100	Not rated		Not rated		Not rated	
SL:							
Sewage lagoon-------	100	Not rated		Not rated		Not rated	
W:							
Water---------------	100	Not rated		Not rated		Not rated	

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading "Soil Properties."

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, reclamation material, roadfill, and topsoil; plan structures for water management; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary, which is in Part I of this publication.

Building Site Development

The titles of the tables described in this section are:

- “Dwellings and Small Commercial Buildings”
- “Roads and Streets, Shallow Excavations, and Lawns and Landscaping”

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. The tables described in this section show the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the tables are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel,

crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Dwellings and Small Commercial Buildings

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
41B:							
Sparta	80	Not limited		Not limited		Not limited	
41C:							
Sparta	80	Not limited		Not limited		Somewhat limited	
						Slope	0.88
43:							
Bremer	100	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
50B:							
Coloma	85	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
63B:							
Chelsea	90	Not limited		Not limited		Not limited	
63C:							
Chelsea	85	Not limited		Not limited		Somewhat limited	
						Slope	0.88
63E:							
Chelsea	85	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
83B:							
Kenyon	75	Not limited		Somewhat limited		Not limited	
				Depth to saturated zone	0.61		
83C:							
Kenyon	75	Not limited		Somewhat limited		Somewhat limited	
				Depth to saturated zone	0.61	Slope	0.88
84:							
Clyde	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	0.18			Shrink-swell	0.18
109B:							
Backbone	100	Somewhat limited		Very limited		Somewhat limited	
		Depth to hard bedrock	0.46	Depth to hard bedrock	1.00	Depth to hard bedrock	0.46

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
109C:							
Backbone------------	100	Somewhat limited		Very limited		Somewhat limited	
		Depth to hard bedrock	0.46	Depth to hard bedrock	1.00	Slope	0.88
						Depth to hard bedrock	0.46
109D:							
Backbone------------	100	Somewhat limited		Very limited		Very limited	
		Slope	0.63	Depth to hard bedrock	1.00	Slope	1.00
		Depth to hard bedrock	0.46	Slope	0.63	Depth to hard bedrock	0.46
127:							
Plano, rarely flooded------------	85	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Shrink-swell	0.82	Shrink-swell	0.82	Shrink-swell	0.82
135:							
Coland, occasionally flooded------------	85	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
153:							
Shandep, ponded, occasionally flooded------------	75	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Ponding	1.00	Ponding	1.00	Ponding	1.00
173:							
Hoopeston, rarely flooded------------	100	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
175B:							
Dickinson-----------	90	Not limited		Not limited		Not limited	
175C:							
Dickinson-----------	100	Not limited		Not limited		Somewhat limited	
						Slope	0.88
178:							
Waukee, rarely flooded------------	85	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
178B:							
Waukee, rarely flooded------------	95	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
178C:							
Waukee, rarely flooded	95	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
						Slope	0.88
184:							
Klinger	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	0.32			Shrink-swell	0.32
198B:							
Floyd	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
221:							
Klossner	100	Very limited		Very limited		Very limited	
		Subsidence	1.00	Subsidence	1.00	Subsidence	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Organic matter content	1.00	Shrink-swell	0.32	Organic matter content	1.00
284B:							
Flagler	90	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
285:							
Burkhardt	100	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
285C:							
Burkhardt	100	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
						Slope	0.12
323B:							
Fort Dodge	85	Not limited		Not limited		Not limited	
344D:							
Copaston	90	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.04	Slope	0.04	Slope	1.00
344G:							
Copaston	85	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Slope	1.00
		Slope	1.00	Slope	1.00	Depth to hard bedrock	1.00
354:							
Aquolls, ponded	90	Not rated		Not rated		Not rated	
377B:							
Dinsdale	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Shrink-swell	0.68	Depth to saturated zone	0.61	Shrink-swell	0.68

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
377C:							
Dinsdale------------	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Shrink-swell	0.68	Depth to saturated zone	0.61	Slope	0.88
						Shrink-swell	0.68
382:							
Maxfield------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	0.18			Shrink-swell	0.18
391B:							
Clyde---------------	60	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	0.18			Shrink-swell	0.18
Floyd---------------	35	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
394B:							
Ostrander-----------	75	Not limited		Not limited		Not limited	
394C:							
Ostrander-----------	85	Not limited		Not limited		Somewhat limited	
						Slope	0.50
395B:							
Marquis-------------	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.39	Depth to saturated zone	1.00	Depth to saturated zone	0.39
398:							
Tripoli-------------	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
399:							
Readlyn-------------	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	0.01			Shrink-swell	0.01
408B:							
Olin----------------	80	Not limited		Not limited		Not limited	
471:							
Oran----------------	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	0.06	Shrink-swell	0.06	Shrink-swell	0.06
485:							
Spillville, occasionally flooded-----------	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
582B:							
Kasson--------------	90	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.39	Depth to saturated zone	1.00	Depth to saturated zone	0.39
582C:							
Kasson--------------	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.39	Depth to saturated zone	1.00	Slope	0.88
						Depth to saturated zone	0.39
585:							
Spillville, occasionally flooded------------	50	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
Coland, occasionally flooded------------	30	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
620B:							
Port Byron----------	90	Not limited		Not limited		Not limited	
620C2:							
Port Byron----------	100	Not limited		Not limited		Somewhat limited	
						Slope	0.88
626:							
Hayfield, rarely flooded------------	90	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
663B:							
Seaton--------------	100	Not limited		Not limited		Not limited	
663C:							
Seaton--------------	100	Not limited		Not limited		Somewhat limited	
						Slope	0.88
663D2:							
Seaton, moderately eroded-------------	90	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.63	Slope	0.63	Slope	1.00
663D3:							
Seaton, severely eroded-------------	90	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.63	Slope	0.63	Slope	1.00

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
663E2:							
Seaton, moderately eroded	90	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
663G:							
Seaton	90	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
775:							
Billett	100	Not limited		Not limited		Not limited	
775B:							
Billett	100	Not limited		Not limited		Not limited	
775C:							
Billett	100	Not limited		Not limited		Somewhat limited	
						Slope	0.88
778:							
Sattre, rarely flooded	85	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
813B:							
Atkinson	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Shrink-swell	0.32	Depth to hard bedrock	0.42	Shrink-swell	0.32
				Shrink-swell	0.32		
813C:							
Atkinson	85	Somewhat limited		Somewhat limited		Somewhat limited	
		Shrink-swell	0.32	Depth to hard bedrock	0.42	Slope	0.88
				Shrink-swell	0.32	Shrink-swell	0.32
814B:							
Rockton	90	Somewhat limited		Very limited		Somewhat limited	
		Depth to hard bedrock	0.35	Depth to hard bedrock	1.00	Depth to hard bedrock	0.35
814C:							
Rockton	85	Somewhat limited		Very limited		Somewhat limited	
		Depth to hard bedrock	0.35	Depth to hard bedrock	1.00	Slope	0.88
						Depth to hard bedrock	0.35
814D:							
Rockton	90	Somewhat limited		Very limited		Very limited	
		Slope	0.63	Depth to hard bedrock	1.00	Slope	1.00
		Depth to hard bedrock	0.35	Slope	0.63	Depth to hard bedrock	0.35
884:							
Klingmore	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
930:							
Orion, occasionally flooded	100	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
982:							
Maxmore	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	0.68	Shrink-swell	0.68	Shrink-swell	0.68
1152:							
Marshan, rarely flooded	75	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
1226:							
Lawler, rarely flooded	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
1585:							
Spillville, channeled	40	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
Coland, channeled	35	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
Aquolls, ponded	15	Not rated		Not rated		Not rated	
1586:							
Sigglekov, frequently flooded	55	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
Fluvaquents, frequently flooded	30	Not rated		Not rated		Not rated	
Aquents, ponded	15	Not rated		Not rated		Not rated	
4946:							
Udorthents	65	Not rated		Not rated		Not rated	
Interstate highway	35	Not rated		Not rated		Not rated	

Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
5010:							
Pits, sand and gravel-------------	100	Not rated		Not rated		Not rated	
5030:							
Pits, limestone quarries-----------	100	Not rated		Not rated		Not rated	
5040:							
Udorthents, loamy---	100	Not rated		Not rated		Not rated	
5080:							
Udorthents, sanitary landfill-----------	100	Not rated		Not rated		Not rated	
8041:							
Sparta, terrace, rarely flooded-----	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
8041B:							
Sparta, terrace, rarely flooded-----	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
8175B:							
Dickinson, terrace, rarely flooded-----	100	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
AW:							
Animal waste lagoon	100	Not rated		Not rated		Not rated	
SL:							
Sewage lagoon-------	100	Not rated		Not rated		Not rated	
W:							
Water---------------	100	Not rated		Not rated		Not rated	

Roads and Streets, Shallow Excavations, and Lawns and Landscaping

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
41B:							
Sparta	80	Not limited		Very limited		Somewhat limited	
				Cutbanks cave	1.00	Droughty	0.07
41C:							
Sparta	80	Not limited		Very limited		Somewhat limited	
				Cutbanks cave	1.00	Droughty	0.07
43:							
Bremer	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Cutbanks cave	0.10		
		Low strength	1.00				
50B:							
Coloma	85	Somewhat limited		Very limited		Somewhat limited	
		Flooding	0.40	Cutbanks cave	1.00	Droughty	0.89
63B:							
Chelsea	90	Not limited		Very limited		Somewhat limited	
				Cutbanks cave	1.00	Droughty	0.28
63C:							
Chelsea	85	Not limited		Very limited		Somewhat limited	
				Cutbanks cave	1.00	Droughty	0.28
63E:							
Chelsea	85	Very limited		Very limited		Very limited	
		Slope	1.00	Cutbanks cave	1.00	Slope	1.00
				Slope	1.00	Droughty	0.28
83B:							
Kenyon	75	Somewhat limited		Somewhat limited		Not limited	
		Frost action	0.50	Depth to saturated zone	0.61		
		Low strength	0.22	Dense layer	0.50		
				Cutbanks cave	0.10		
83C:							
Kenyon	75	Somewhat limited		Somewhat limited		Not limited	
		Frost action	0.50	Depth to saturated zone	0.61		
		Low strength	0.22	Dense layer	0.50		
				Cutbanks cave	0.10		
84:							
Clyde	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Dense layer	0.50		
		Low strength	1.00	Cutbanks cave	0.10		

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
109B:							
Backbone-----------	100	Somewhat limited		Very limited		Somewhat limited	
		Frost action	0.50	Depth to hard bedrock	1.00	Depth to bedrock	0.46
		Depth to hard bedrock	0.46	Cutbanks cave	0.10	Droughty	0.02
109C:							
Backbone-----------	100	Somewhat limited		Very limited		Somewhat limited	
		Frost action	0.50	Depth to hard bedrock	1.00	Depth to bedrock	0.46
		Depth to hard bedrock	0.46	Cutbanks cave	0.10	Droughty	0.02
109D:							
Backbone-----------	100	Somewhat limited		Very limited		Somewhat limited	
		Slope	0.63	Depth to hard bedrock	1.00	Slope	0.63
		Frost action	0.50	Slope	0.63	Depth to bedrock	0.46
		Depth to hard bedrock	0.46	Cutbanks cave	0.10	Droughty	0.02
127:							
Plano, rarely flooded-----------	85	Very limited		Somewhat limited		Not limited	
		Frost action	1.00	Cutbanks cave	0.10		
		Low strength	1.00				
		Shrink-swell	0.82				
135:							
Coland, occasionally flooded-----------	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Flooding	0.60	Flooding	0.60
		Flooding	1.00	Cutbanks cave	0.10		
153:							
Shandep, ponded, occasionally flooded-----------	75	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Cutbanks cave	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Depth to saturated zone	1.00	Ponding	1.00
		Low strength	1.00	Ponding	1.00		
173:							
Hoopeston, rarely flooded-----------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Cutbanks cave	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Depth to saturated zone	1.00		
		Flooding	0.40				
175B:							
Dickinson----------	90	Somewhat limited		Very limited		Not limited	
		Frost action	0.50	Cutbanks cave	1.00		
175C:							
Dickinson----------	100	Somewhat limited		Very limited		Not limited	
		Frost action	0.50	Cutbanks cave	1.00		

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
178:							
Waukee, rarely flooded-----------	85	Somewhat limited		Very limited		Not limited	
		Flooding	0.40	Cutbanks cave	1.00		
178B:							
Waukee, rarely flooded-----------	95	Somewhat limited		Very limited		Not limited	
		Flooding	0.40	Cutbanks cave	1.00		
178C:							
Waukee, rarely flooded-----------	95	Somewhat limited		Very limited		Not limited	
		Flooding	0.40	Cutbanks cave	1.00		
184:							
Klinger-------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Dense layer	0.50		
		Low strength	1.00	Cutbanks cave	0.10		
198B:							
Floyd---------------	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Dense layer	0.50		
		Low strength	1.00	Cutbanks cave	0.10		
221:							
Klossner------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Subsidence	1.00	Organic matter content	1.00		
		Frost action	1.00	Dense layer	0.50		
284B:							
Flagler-------------	90	Somewhat limited		Very limited		Not limited	
		Flooding	0.40	Cutbanks cave	1.00		
285:							
Burkhardt-----------	100	Somewhat limited		Very limited		Somewhat limited	
		Flooding	0.40	Cutbanks cave	1.00	Droughty	0.52
285C:							
Burkhardt-----------	100	Somewhat limited		Very limited		Somewhat limited	
		Flooding	0.40	Cutbanks cave	1.00	Droughty	0.52
323B:							
Fort Dodge----------	85	Very limited		Very limited		Not limited	
		Low strength	1.00	Cutbanks cave	1.00		
		Frost action	0.50				
344D:							
Copaston------------	90	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to bedrock	1.00
						Droughty	0.57
		Frost action	0.50	Cutbanks cave	0.10	Slope	0.04
		Slope	0.04	Slope	0.04		

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
344G:							
Copaston------------	85	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to bedrock	1.00
		Slope	1.00	Slope	1.00	Slope	1.00
		Frost action	0.50	Cutbanks cave	0.10	Droughty	0.57
354:							
Aquolls, ponded-----	90	Not rated		Not rated		Not rated	
377B:							
Dinsdale------------	90	Very limited		Somewhat limited		Not limited	
		Frost action	1.00	Depth to saturated zone	0.61		
		Low strength	1.00	Dense layer	0.50		
		Shrink-swell	0.68	Cutbanks cave	0.10		
377C:							
Dinsdale------------	90	Very limited		Somewhat limited		Not limited	
		Frost action	1.00	Depth to saturated zone	0.61		
		Low strength	1.00	Dense layer	0.50		
		Shrink-swell	0.68	Cutbanks cave	0.10		
382:							
Maxfield------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Dense layer	0.50		
		Low strength	1.00	Cutbanks cave	0.10		
391B:							
Clyde---------------	60	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Dense layer	0.50		
		Low strength	1.00	Cutbanks cave	0.10		
Floyd---------------	35	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Dense layer	0.50		
		Low strength	1.00	Cutbanks cave	0.10		
394B:							
Ostrander-----------	75	Somewhat limited		Somewhat limited		Not limited	
		Low strength	0.78	Dense layer	0.50		
		Frost action	0.50	Cutbanks cave	0.10		
394C:							
Ostrander-----------	85	Somewhat limited		Somewhat limited		Not limited	
		Low strength	0.78	Dense layer	0.50		
		Frost action	0.50	Cutbanks cave	0.10		
395B:							
Marquis-------------	80	Somewhat limited		Very limited		Somewhat limited	
		Frost action	0.50	Depth to saturated zone	1.00	Depth to saturated zone	0.19
		Depth to saturated zone	0.19	Dense layer	0.50		
				Cutbanks cave	0.10		

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
398:							
Tripoli-------------	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Dense layer	0.50		
		Low strength	0.22	Cutbanks cave	0.10		
399:							
Readlyn-------------	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Dense layer	0.50		
		Low strength	1.00	Cutbanks cave	0.10		
408B:							
Olin----------------	80	Somewhat limited		Somewhat limited		Not limited	
		Frost action	0.50	Dense layer	0.50		
				Cutbanks cave	0.10		
471:							
Oran----------------	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Dense layer	0.50		
		Low strength	0.78	Cutbanks cave	0.10		
485:							
Spillville, occasionally flooded-----------	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00	Flooding	0.60	Flooding	0.60
		Low strength	0.78	Cutbanks cave	0.10		
582B:							
Kasson--------------	90	Somewhat limited		Very limited		Somewhat limited	
		Frost action	0.50	Depth to saturated zone	1.00	Depth to saturated zone	0.19
		Low strength	0.22				
		Depth to saturated zone	0.19	Dense layer	0.50		
				Cutbanks cave	0.10		
582C:							
Kasson--------------	80	Somewhat limited		Very limited		Somewhat limited	
		Frost action	0.50	Depth to saturated zone	1.00	Depth to saturated zone	0.19
		Low strength	0.22				
		Depth to saturated zone	0.19	Dense layer	0.50		
				Cutbanks cave	0.10		
585:							
Spillville, occasionally flooded-----------	50	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Flooding	1.00	Flooding	0.60	Flooding	0.60
		Low strength	0.78	Cutbanks cave	0.10		

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
585:							
Coland, occasionally flooded	30	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Flooding	0.60	Flooding	0.60
		Flooding	1.00	Cutbanks cave	0.10		
620B:							
Port Byron	90	Very limited		Somewhat limited		Not limited	
		Frost action	1.00	Cutbanks cave	0.10		
		Low strength	1.00				
620C2:							
Port Byron	100	Very limited		Somewhat limited		Not limited	
		Frost action	1.00	Cutbanks cave	0.10		
		Low strength	1.00				
626:							
Hayfield, rarely flooded	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Cutbanks cave	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Depth to saturated zone	1.00		
		Low strength	0.78				
663B:							
Seaton	100	Very limited		Somewhat limited		Not limited	
		Frost action	1.00	Cutbanks cave	0.10		
		Low strength	1.00				
663C:							
Seaton	100	Very limited		Somewhat limited		Not limited	
		Frost action	1.00	Cutbanks cave	0.10		
		Low strength	1.00				
663D2:							
Seaton, moderately eroded	90	Very limited		Somewhat limited		Somewhat limited	
		Frost action	1.00	Slope	0.63	Slope	0.63
		Low strength	1.00	Cutbanks cave	0.10		
		Slope	0.63				
663D3:							
Seaton, severely eroded	90	Very limited		Somewhat limited		Somewhat limited	
		Frost action	1.00	Slope	0.63	Slope	0.63
		Low strength	1.00	Cutbanks cave	0.10		
		Slope	0.63				
663E2:							
Seaton, moderately eroded	90	Very limited		Very limited		Very limited	
		Frost action	1.00	Slope	1.00	Slope	1.00
		Slope	1.00	Cutbanks cave	0.10		
		Low strength	1.00				

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
663G:							
Seaton--------------	90	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Frost action	1.00	Cutbanks cave	0.10		
		Low strength	1.00				
775:							
Billett-------------	100	Somewhat limited		Very limited		Not limited	
		Frost action	0.50	Cutbanks cave	1.00		
775B:							
Billett-------------	100	Somewhat limited		Very limited		Not limited	
		Frost action	0.50	Cutbanks cave	1.00		
775C:							
Billett-------------	100	Somewhat limited		Very limited		Not limited	
		Frost action	0.50	Cutbanks cave	1.00		
778:							
Sattre, rarely flooded-----------	85	Somewhat limited		Very limited		Not limited	
		Flooding	0.40	Cutbanks cave	1.00		
813B:							
Atkinson-----------	90	Very limited		Somewhat limited		Not limited	
		Low strength	1.00	Depth to hard bedrock	0.42		
		Frost action	0.50				
		Shrink-swell	0.32	Too clayey	0.12		
				Cutbanks cave	0.10		
813C:							
Atkinson-----------	85	Very limited		Somewhat limited		Not limited	
		Low strength	1.00	Depth to hard bedrock	0.42		
		Frost action	0.50				
		Shrink-swell	0.32	Too clayey	0.12		
				Cutbanks cave	0.10		
814B:							
Rockton------------	90	Very limited		Very limited		Somewhat limited	
		Low strength	1.00	Depth to hard bedrock	1.00	Depth to bedrock	0.35
		Frost action	0.50				
		Depth to hard bedrock	0.35	Cutbanks cave	0.10		
				Too clayey	0.01		
814C:							
Rockton------------	85	Very limited		Very limited		Somewhat limited	
		Low strength	1.00	Depth to hard bedrock	1.00	Depth to bedrock	0.35
		Frost action	0.50				
		Depth to hard bedrock	0.35	Cutbanks cave	0.10		
				Too clayey	0.01		
814D:							
Rockton------------	90	Very limited		Very limited		Somewhat limited	
		Low strength	1.00	Depth to hard bedrock	1.00	Slope	0.63
		Slope	0.63			Depth to bedrock	0.35
		Frost action	0.50	Slope	0.63		
				Cutbanks cave	0.10		

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
884:							
Klingmore	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Dense layer	0.50		
		Low strength	1.00	Cutbanks cave	0.10		
930:							
Orion, occasionally flooded	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Cutbanks cave	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Depth to saturated zone	1.00	Flooding	0.60
		Flooding	1.00	Flooding	0.60		
982:							
Maxmore	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Dense layer	0.50		
		Low strength	1.00	Cutbanks cave	0.10		
1152:							
Marshan, rarely flooded	75	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Cutbanks cave	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Depth to saturated zone	1.00		
		Flooding	0.40				
1226:							
Lawler, rarely flooded	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Cutbanks cave	1.00	Depth to saturated zone	1.00
		Frost action	1.00	Depth to saturated zone	1.00		
		Flooding	0.40				
1585:							
Spillville, channeled	40	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Flooding	1.00
		Flooding	1.00	Flooding	0.80	Depth to saturated zone	1.00
		Low strength	0.78	Cutbanks cave	0.10		
Coland, channeled	35	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Flooding	1.00
		Frost action	1.00	Flooding	0.80	Depth to saturated zone	1.00
		Flooding	1.00	Cutbanks cave	0.10		
Aquolls, ponded	15	Not rated		Not rated		Not rated	

Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
1586:							
Sigglekov, frequently flooded	55	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Cutbanks cave	1.00	Flooding	1.00
		Flooding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
				Flooding	0.80	Droughty	0.98
Fluvaquents, frequently flooded	30	Not rated		Not rated		Not rated	
Aquents, ponded-----	15	Not rated		Not rated		Not rated	
4946:							
Udorthents----------	65	Not rated		Not rated		Not rated	
Interstate highway--	35	Not rated		Not rated		Not rated	
5010:							
Pits, sand and gravel-------------	100	Not rated		Not rated		Not rated	
5030:							
Pits, limestone quarries-----------	100	Not rated		Not rated		Not rated	
5040:							
Udorthents, loamy---	100	Not rated		Not rated		Not rated	
5080:							
Udorthents, sanitary landfill-----------	100	Not rated		Not rated		Not rated	
8041:							
Sparta, terrace, rarely flooded-----	80	Somewhat limited		Very limited		Somewhat limited	
		Flooding	0.40	Cutbanks cave	1.00	Droughty	0.07
8041B:							
Sparta, terrace, rarely flooded-----	80	Somewhat limited		Very limited		Somewhat limited	
		Flooding	0.40	Cutbanks cave	1.00	Droughty	0.07
8175B:							
Dickinson, terrace, rarely flooded-----	100	Somewhat limited		Very limited		Not limited	
		Frost action	0.50	Cutbanks cave	1.00		
		Flooding	0.40				
AW:							
Animal waste lagoon	100	Not rated		Not rated		Not rated	
SL:							
Sewage lagoon-------	100	Not rated		Not rated		Not rated	
W:							
Water---------------	100	Not rated		Not rated		Not rated	

Sanitary Facilities

The titles of the tables described in this section are:

- “Sewage Disposal”
- “Landfills”

These tables show the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, sanitary landfills, and daily cover for landfill. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

A *trench sanitary landfill* is an area where solid waste is placed in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil excavated at the site. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. The ratings in the table are based on the soil properties that affect the risk of pollution, the ease of excavation, trafficability, and revegetation. These properties include permeability, depth to bedrock or a cemented pan, depth to a water table, ponding, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, onsite investigation may be needed.

Hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or directly below the proposed trench bottom can affect the ease of excavation and the hazard of ground-water pollution. Slope affects construction of the trenches and the movement of surface water around the landfill. It also affects the construction and performance of roads in areas of the landfill.

Soil texture and consistence affect the ease with which the trench is dug and the ease with which the soil can be used as daily or final cover. They determine the workability of the soil when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and are difficult to place as a uniformly thick cover over a layer of refuse.

The soil material used as the final cover for a trench landfill should be suitable for plants. It should not have excess sodium or salts and should not be too acid. The surface layer generally has the best workability, the highest content of organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

In an *area sanitary landfill*, solid waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site. A final cover of soil material at least 2 feet thick is placed over the completed landfill. The ratings in the table are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, permeability, depth to a water table, ponding, slope, and depth to bedrock or a cemented pan.

Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If permeability is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The ratings in the table also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and dry periods. These properties include soil texture, depth to a

water table, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. It should not have excess sodium, salts, or lime and should not be too acid.

Sewage Disposal

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
41B:					
Sparta	80	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Slope	0.32
41C:					
Sparta	80	Very limited		Very limited	
		Filtering capacity	1.00	Slope	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
43:					
Bremer	100	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.99	Flooding	0.40
		Flooding	0.40	Seepage	0.01
50B:					
Coloma	85	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Flooding	0.40
		Flooding	0.40	Slope	0.08
63B:					
Chelsea	90	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Slope	0.32
63C:					
Chelsea	85	Very limited		Very limited	
		Filtering capacity	1.00	Slope	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
63E:					
Chelsea	85	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Filtering capacity	1.00	Seepage	1.00
		Seepage, bottom layer	1.00		

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
83B:					
Kenyon	75	Very limited		Somewhat limited	
		Slow water movement	1.00	Depth to saturated zone	0.71
		Depth to saturated zone	0.99	Slope	0.08
				Seepage	0.01
83C:					
Kenyon	75	Very limited		Very limited	
		Slow water movement	1.00	Slope	1.00
		Depth to saturated zone	0.99	Depth to saturated zone	0.71
				Seepage	0.01
84:					
Clyde	80	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Seepage	0.01
109B:					
Backbone	100	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slow water movement	0.99	Seepage	1.00
				Slope	0.32
109C:					
Backbone	100	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slow water movement	0.99	Slope	1.00
				Seepage	1.00
109D:					
Backbone	100	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slow water movement	0.99	Slope	1.00
		Slope	0.63	Seepage	1.00
127:					
Plano, rarely flooded	85	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
		Slow water movement	0.99	Flooding	0.40
		Flooding	0.40		
135:					
Coland, occasionally flooded	85	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.99	Seepage	0.01

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
153:					
Shandep, ponded, occasionally flooded-----------	75	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
				Ponding	1.00
		Ponding	1.00		
173:					
Hoopeston, rarely flooded-----------	100	Very limited		Very limited	
		Depth to saturated zone	1.00	Seepage	1.00
				Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Flooding	0.40
		Filtering capacity	1.00		
175B:					
Dickinson-----------	90	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
				Slope	0.32
		Seepage, bottom layer	1.00		
175C:					
Dickinson-----------	100	Very limited		Very limited	
		Filtering capacity	1.00	Slope	1.00
				Seepage	1.00
		Seepage, bottom layer	1.00		
178:					
Waukee, rarely flooded-----------	85	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Flooding	0.40
		Slow water movement	0.99		
		Flooding	0.40		
178B:					
Waukee, rarely flooded-----------	95	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Flooding	0.40
		Slow water movement	0.99	Slope	0.32
		Flooding	0.40		
178C:					
Waukee, rarely flooded-----------	95	Very limited		Very limited	
		Seepage, bottom layer	1.00	Slope	1.00
				Seepage	1.00
		Slow water movement	0.99	Flooding	0.40
		Flooding	0.40		

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
184:					
Klinger	100	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Seepage	0.01
198B:					
Floyd	90	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Slope	0.08
				Seepage	0.01
221:					
Klossner	100	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Subsidence	1.00	Organic matter content	1.00
		Slow water movement	0.98	Seepage	0.02
284B:					
Flagler	90	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
		Filtering capacity	1.00	Flooding	0.40
		Flooding	0.40		
285:					
Burkhardt	100	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Flooding	0.40
		Flooding	0.40		
285C:					
Burkhardt	100	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Slope	0.68
		Flooding	0.40	Flooding	0.40
323B:					
Fort Dodge	85	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Seepage, bottom layer	1.00		
344D:					
Copaston	90	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Seepage, bottom layer	1.00	Slope	1.00
		Slope	0.04	Seepage	1.00

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
344G:					
Copaston------------	85	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	1.00	Slope	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
354:					
Aquolls, ponded-----	90	Not rated		Not rated	
377B:					
Dinsdale------------	90	Very limited		Somewhat limited	
		Slow water movement	1.00	Depth to saturated zone	0.71
		Depth to saturated zone	0.99	Slope	0.08
				Seepage	0.01
377C:					
Dinsdale------------	90	Very limited		Very limited	
		Slow water movement	1.00	Slope	1.00
		Depth to saturated zone	0.99	Depth to saturated zone	0.71
				Seepage	0.01
382:					
Maxfield------------	100	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Seepage	0.01
391B:					
Clyde---------------	60	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Seepage	0.01
Floyd---------------	35	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Slope	0.08
				Seepage	0.01
394B:					
Ostrander-----------	75	Very limited		Somewhat limited	
		Slow water movement	1.00	Slope	0.32
				Seepage	0.01
394C:					
Ostrander-----------	85	Very limited		Somewhat limited	
		Slow water movement	1.00	Slope	0.92
				Seepage	0.01
395B:					
Marquis-------------	80	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Slope	0.08
				Seepage	0.01

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
398:					
Tripoli	90	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Seepage	0.01
399:					
Readlyn	85	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Seepage	0.01
408B:					
Olin	80	Very limited		Very limited	
		Slow water movement	1.00	Seepage	1.00
				Slope	0.32
471:					
Oran	85	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Seepage	0.01
485:					
Spillville, occasionally flooded	80	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.99	Seepage	0.01
582B:					
Kasson	90	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Slope	0.32
				Seepage	0.01
582C:					
Kasson	80	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Slope	1.00
				Seepage	0.01
585:					
Spillville, occasionally flooded	50	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.99	Seepage	0.01

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
585:					
Coland, occasionally flooded-----------	30	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.99	Seepage	0.01
620B:					
Port Byron----------	90	Somewhat limited		Somewhat limited	
		Slow water movement	0.99	Slope	0.32
				Seepage	0.01
620C2:					
Port Byron----------	100	Somewhat limited		Very limited	
		Slow water movement	0.99	Slope	1.00
				Seepage	0.01
626:					
Hayfield, rarely flooded-----------	90	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
				Flooding	0.40
		Slow water movement	0.99		
663B:					
Seaton--------------	100	Somewhat limited		Somewhat limited	
		Slow water movement	0.99	Slope	0.08
				Seepage	0.01
663C:					
Seaton--------------	100	Somewhat limited		Very limited	
		Slow water movement	0.99	Slope	1.00
				Seepage	0.01
663D2:					
Seaton, moderately eroded------------	90	Somewhat limited		Very limited	
		Slow water movement	0.99	Slope	1.00
				Seepage	0.01
		Slope	0.63		
663D3:					
Seaton, severely eroded------------	90	Somewhat limited		Very limited	
		Slow water movement	0.99	Slope	1.00
				Seepage	0.01
		Slope	0.63		
663E2:					
Seaton, moderately eroded------------	90	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Slow water movement	0.99	Seepage	0.01

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
663G:					
Seaton	90	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Slow water movement	0.99	Seepage	0.01
775:					
Billett	100	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
		Filtering capacity	1.00		
775B:					
Billett	100	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Slope	0.32
		Filtering capacity	1.00		
775C:					
Billett	100	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Slope	1.00
		Filtering capacity	1.00		
778:					
Sattre, rarely flooded	85	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
				Flooding	0.40
		Slow water movement	0.99		
		Flooding	0.40		
813B:					
Atkinson	90	Very limited		Somewhat limited	
		Slow water movement	1.00	Depth to hard bedrock	0.42
		Depth to bedrock	0.78	Slope	0.08
				Seepage	0.02
813C:					
Atkinson	85	Very limited		Very limited	
		Slow water movement	1.00	Slope	1.00
				Depth to hard bedrock	0.42
		Depth to bedrock	0.78	Seepage	0.02
814B:					
Rockton	90	Very limited		Very limited	
		Slow water movement	1.00	Depth to hard bedrock	1.00
		Depth to bedrock	1.00	Slope	0.08
				Seepage	0.02

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
814C:					
Rockton	85	Very limited		Very limited	
		Slow water movement	1.00	Depth to hard bedrock	1.00
		Depth to bedrock	1.00	Slope	1.00
				Seepage	0.02
814D:					
Rockton	90	Very limited		Very limited	
		Slow water movement	1.00	Depth to hard bedrock	1.00
		Depth to bedrock	1.00	Slope	1.00
		Slope	0.63	Seepage	0.02
884:					
Klingmore	100	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Seepage	0.01
930:					
Orion, occasionally flooded	100	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.99	Seepage	0.01
982:					
Maxmore	100	Very limited		Very limited	
		Slow water movement	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Seepage	0.01
1152:					
Marshan, rarely flooded	75	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
		Slow water movement	0.99	Flooding	0.40
1226:					
Lawler, rarely flooded	80	Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
		Slow water movement	0.99	Flooding	0.40

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
1585:					
Spillville, channeled	40	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.99	Seepage	0.01
Coland, channeled	35	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Slow water movement	0.99	Seepage	0.01
Aquolls, ponded	15	Not rated		Not rated	
1586:					
Sigglekov, frequently flooded	55	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Filtering capacity	1.00	Seepage	1.00
Fluvaquents, frequently flooded	30	Not rated		Not rated	
Aquents, ponded	15	Not rated		Not rated	
4946:					
Udorthents	65	Not rated		Not rated	
Interstate highway	35	Not rated		Not rated	
5010:					
Pits, sand and gravel	100	Not rated		Not rated	
5030:					
Pits, limestone quarries	100	Not rated		Not rated	
5040:					
Udorthents, loamy	100	Not rated		Not rated	
5080:					
Udorthents, sanitary landfill	100	Not rated		Not rated	
8041:					
Sparta, terrace, rarely flooded	80	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Flooding	0.40
		Flooding	0.40		

Sewage Disposal--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
8041B:					
Sparta, terrace, rarely flooded-----	80	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Flooding	0.40
		Flooding	0.40	Slope	0.08
8175B:					
Dickinson, terrace, rarely flooded-----	100	Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00
		Filtering capacity	1.00	Flooding	0.40
		Flooding	0.40	Slope	0.32
AW:					
Animal waste lagoon	100	Not rated		Not rated	
SL:					
Sewage lagoon-------	100	Not rated		Not rated	
W:					
Water---------------	100	Not rated		Not rated	

Landfills

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
41B:							
Sparta--------------	80	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00			Seepage	1.00
41C:							
Sparta--------------	80	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00			Seepage	1.00
43:							
Bremer--------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too clayey	0.50	Flooding	0.40	Hard to compact	1.00
		Flooding	0.40			Too clayey	0.50
50B:							
Coloma--------------	85	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00	Flooding	0.40	Seepage	1.00
		Flooding	0.40				
63B:							
Chelsea-------------	90	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00			Seepage	1.00
63C:							
Chelsea-------------	85	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00			Seepage	1.00
63E:							
Chelsea-------------	85	Very limited		Very limited		Very limited	
		Too sandy	1.00	Slope	1.00	Too sandy	1.00
		Slope	1.00	Seepage	1.00	Slope	1.00
		Seepage, bottom layer	1.00			Seepage	1.00
83B:							
Kenyon--------------	75	Very limited		Very limited		Not limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00		
83C:							
Kenyon--------------	75	Very limited		Very limited		Not limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00		

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill: Rating class and limiting features	Value	Area sanitary landfill: Rating class and limiting features	Value	Daily cover for landfill: Rating class and limiting features	Value
84:							
Clyde	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
109B:							
Backbone	100	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
				Seepage	1.00	Seepage	1.00
109C:							
Backbone	100	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
				Seepage	1.00	Seepage	1.00
109D:							
Backbone	100	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Slope	0.63	Seepage	1.00	Seepage	1.00
				Slope	0.63	Slope	0.63
127:							
Plano, rarely flooded	85	Very limited		Somewhat limited		Somewhat limited	
		Seepage, bottom layer	1.00	Flooding	0.40	Too clayey	0.50
		Too clayey	0.50				
		Flooding	0.40				
135:							
Coland, occasionally flooded	85	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Hard to compact	1.00
		Too clayey	0.50			Too clayey	0.50
153:							
Shandep, ponded, occasionally flooded	75	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Ponding	1.00	Hard to compact	1.00
		Ponding	1.00	Flooding	0.40	Ponding	1.00
173:							
Hoopeston, rarely flooded	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
		Flooding	0.40	Flooding	0.40		

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill: Rating class and limiting features	Value	Area sanitary landfill: Rating class and limiting features	Value	Daily cover for landfill: Rating class and limiting features	Value
175B:							
Dickinson	90	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00			Seepage	1.00
175C:							
Dickinson	100	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00			Seepage	1.00
178:							
Waukee, rarely flooded	85	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00	Flooding	0.40	Seepage	1.00
		Flooding	0.40				
178B:							
Waukee, rarely flooded	95	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00	Flooding	0.40	Seepage	1.00
		Flooding	0.40				
178C:							
Waukee, rarely flooded	95	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00	Flooding	0.40	Seepage	1.00
		Flooding	0.40				
184:							
Klinger	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
198B:							
Floyd	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
221:							
Klossner	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too clayey	0.50				
284B:							
Flagler	90	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
		Too sandy	0.50	Flooding	0.40	Too sandy	0.50
		Flooding	0.40				

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill: Rating class and limiting features	Value	Area sanitary landfill: Rating class and limiting features	Value	Daily cover for landfill: Rating class and limiting features	Value
285:							
Burkhardt-----------	100	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00	Flooding	0.40	Seepage	1.00
						Gravel content	0.12
		Flooding	0.40				
285C:							
Burkhardt-----------	100	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00	Flooding	0.40	Seepage	1.00
						Gravel content	0.12
		Flooding	0.40				
323B:							
Fort Dodge----------	85	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
344D:							
Copaston------------	90	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Seepage, bottom layer	1.00	Slope	0.04	Seepage	1.00
						Slope	0.04
		Slope	0.04				
344G:							
Copaston------------	85	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Slope	1.00	Slope	1.00	Slope	1.00
		Seepage, bottom layer	1.00			Seepage	1.00
354:							
Aquolls, ponded-----	90	Not rated		Very limited		Not rated	
				Ponding	1.00		
				Depth to saturated zone	1.00		
377B:							
Dinsdale------------	90	Very limited		Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
377C:							
Dinsdale------------	90	Very limited		Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
382:							
Maxfield------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
391B:							
Clyde---------------	60	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
391B:							
Floyd---------------	35	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
394B:							
Ostrander-----------	75	Not limited		Not limited		Not limited	
394C:							
Ostrander-----------	85	Not limited		Not limited		Not limited	
395B:							
Marquis-------------	80	Very limited		Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.86
398:							
Tripoli-------------	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
399:							
Readlyn-------------	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
						Too clayey	0.50
408B:							
Olin----------------	80	Not limited		Very limited		Not limited	
				Seepage	1.00		
471:							
Oran----------------	85	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too clayey	0.50			Too clayey	0.50
485:							
Spillville, occasionally flooded------------	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00		
582B:							
Kasson--------------	90	Very limited		Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.86
582C:							
Kasson--------------	80	Very limited		Very limited		Somewhat limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.86

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill: Rating class and limiting features	Value	Area sanitary landfill: Rating class and limiting features	Value	Daily cover for landfill: Rating class and limiting features	Value
585:							
Spillville, occasionally flooded	50	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00		
Coland, occasionally flooded	30	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Hard to compact	1.00
		Too clayey	0.50			Too clayey	0.50
620B:							
Port Byron	90	Not limited		Not limited		Not limited	
620C2:							
Port Byron	100	Not limited		Not limited		Not limited	
626:							
Hayfield, rarely flooded	90	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00	Flooding	0.40	Seepage	1.00
663B:							
Seaton	100	Not limited		Not limited		Not limited	
663C:							
Seaton	100	Not limited		Not limited		Not limited	
663D2:							
Seaton, moderately eroded	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Slope	0.63	Slope	0.63	Slope	0.63
663D3:							
Seaton, severely eroded	90	Somewhat limited		Somewhat limited		Somewhat limited	
		Slope	0.63	Slope	0.63	Slope	0.63
663E2:							
Seaton, moderately eroded	90	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
663G:							
Seaton	90	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
775:							
Billett	100	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill: Rating class and limiting features	Value	Area sanitary landfill: Rating class and limiting features	Value	Daily cover for landfill: Rating class and limiting features	Value
775B:							
Billett-------------	100	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
775C:							
Billett-------------	100	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	1.00
778:							
Sattre, rarely flooded------------	85	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00	Flooding	0.40	Seepage	1.00
		Flooding	0.40				
813B:							
Atkinson------------	90	Very limited		Somewhat limited		Somewhat limited	
		Depth to bedrock	1.00	Depth to bedrock	0.42	Too clayey	0.50
		Too clayey	0.50			Depth to bedrock	0.42
813C:							
Atkinson------------	85	Very limited		Somewhat limited		Somewhat limited	
		Depth to bedrock	1.00	Depth to bedrock	0.42	Too clayey	0.50
		Too clayey	0.50			Depth to bedrock	0.42
814B:							
Rockton-------------	90	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
814C:							
Rockton-------------	85	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
814D:							
Rockton-------------	90	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Slope	0.63	Slope	0.63	Slope	0.63
884:							
Klingmore-----------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too clayey	0.50			Too clayey	0.50
930:							
Orion, occasionally flooded------------	100	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00		
982:							
Maxmore-------------	100	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too clayey	0.50			Too clayey	0.50

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1152:							
Marshan, rarely flooded	75	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00	Flooding	0.40	Seepage	1.00
1226:							
Lawler, rarely flooded	80	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00	Flooding	0.40	Seepage	1.00
1585:							
Spillville, channeled	40	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00		
Coland, channeled	35	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Hard to compact	1.00
		Too clayey	0.50			Too clayey	0.50
Aquolls, ponded	15	Not rated		Very limited		Not rated	
				Flooding	1.00		
				Ponding	1.00		
				Depth to saturated zone	1.00		
1586:							
Sigglekov, frequently flooded	55	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too sandy	1.00
		Too sandy	1.00	Seepage	1.00	Seepage	1.00
Fluvaquents, frequently flooded	30	Not rated		Very limited		Not rated	
				Flooding	1.00		
				Depth to saturated zone	1.00		
Aquents, ponded	15	Not rated		Very limited		Not rated	
				Flooding	1.00		
				Ponding	1.00		
				Depth to saturated zone	1.00		

Landfills--Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
4946:							
Udorthents----------	65	Not rated		Not rated		Not rated	
Interstate highway--	35	Not rated		Not rated		Not rated	
5010:							
Pits, sand and gravel------------	100	Not rated		Not rated		Not rated	
5030:							
Pits, limestone quarries-----------	100	Not rated		Not rated		Not rated	
5040:							
Udorthents, loamy---	100	Not rated		Not rated		Not rated	
5080:							
Udorthents, sanitary landfill-----------	100	Not rated		Not rated		Not rated	
8041:							
Sparta, terrace, rarely flooded-----	80	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00	Flooding	0.40	Seepage	1.00
		Flooding	0.40				
8041B:							
Sparta, terrace, rarely flooded-----	80	Very limited		Very limited		Very limited	
		Too sandy	1.00	Seepage	1.00	Too sandy	1.00
		Seepage, bottom layer	1.00	Flooding	0.40	Seepage	1.00
		Flooding	0.40				
8175B:							
Dickinson, terrace, rarely flooded-----	100	Very limited		Very limited		Very limited	
		Seepage, bottom layer	1.00	Seepage	1.00	Too sandy	1.00
		Too sandy	1.00	Flooding	0.40	Seepage	1.00
		Flooding	0.40				
AW:							
Animal waste lagoon	100	Not rated		Not rated		Not rated	
SL:							
Sewage lagoon-------	100	Not rated		Not rated		Not rated	
W:							
Water---------------	100	Not rated		Not rated		Not rated	

Construction Materials

The titles of the tables described in this section are:

- “Source of Sand and Gravel”
- “Source of Reclamation Material, Roadfill, and Topsoil”

These tables give information about the soils as potential sources of gravel, sand, reclamation material, roadfill, and topsoil. Normal compaction, minor processing, and other standard construction practices are assumed.

Gravel and *sand* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the table “Source of Sand and Gravel,” only the likelihood of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness.

The soils are rated as *improbable, possible, probable,* or *very likely* sources of gravel. The bottom layer and the thickest layer of the soils are assigned numerical ratings. These ratings indicate the likelihood that the layer is a source of gravel. The number 0.00 indicates an improbable source; 0.01 to 0.39, a possible source; 0.40 to 0.99, a probable source; and 1.00, a very likely source.

The soils are rated *good, fair,* or *poor* as potential sources of sand. A rating of good or fair means that the source material is likely to be in or below the soil. The bottom layer and the thickest layer of the soils are assigned numerical ratings. The larger the number, the greater the likelihood that the layer is a source of sand.

In the table “Source of Reclamation Material, Roadfill, and Topsoil,” the rating class terms are *good, fair,* and *poor*. The features that limit the soils as sources of these materials are specified in the tables. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of reclamation material, roadfill, and topsoil. The lower the number, the greater the limitation.

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in

place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Source of Sand and Gravel

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The ratings given for the thickest layer are for the thickest layer above and excluding the bottom layer. The numbers in the value columns range from 0.00 to 0.99. The greater the value, the greater the likelihood that the bottom layer or thickest layer of the soil is a source of sand or gravel. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
41B:					
Sparta	80	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.27
		Bottom layer	0.00	Bottom layer	0.35
41C:					
Sparta	80	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.27
		Bottom layer	0.00	Bottom layer	0.35
43:					
Bremer	100	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
50B:					
Coloma	85	Improbable		Fair	
		Thickest layer	0.00	Bottom layer	0.31
		Bottom layer	0.00	Thickest layer	0.75
63B:					
Chelsea	90	Improbable		Fair	
		Thickest layer	0.00	Bottom layer	0.12
		Bottom layer	0.00	Thickest layer	0.12
63C:					
Chelsea	85	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.12
		Bottom layer	0.00	Bottom layer	0.12
63E:					
Chelsea	85	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.12
		Bottom layer	0.00	Bottom layer	0.12
83B:					
Kenyon	75	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
83C:					
Kenyon	75	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
84:					
Clyde	80	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00

Source of Sand and Gravel--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
109B:					
Backbone------------	100	Improbable		Fair	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.06
109C:					
Backbone------------	100	Improbable		Fair	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.06
109D:					
Backbone------------	100	Improbable		Fair	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.06
127:					
Plano, rarely flooded------------	85	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.33
135:					
Coland, occasionally flooded------------	85	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.03
153:					
Shandep, ponded, occasionally flooded------------	75	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.09
173:					
Hoopeston, rarely flooded------------	100	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.03
		Bottom layer	0.00	Bottom layer	0.31
175B:					
Dickinson-----------	90	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.36
175C:					
Dickinson-----------	100	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.36
178:					
Waukee, rarely flooded------------	85	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.09
		Bottom layer	0.00	Bottom layer	0.68
178B:					
Waukee, rarely flooded------------	95	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.09
		Bottom layer	0.00	Bottom layer	0.68

Source of Sand and Gravel--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
178C:					
Waukee, rarely flooded-----------	95	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.09
		Bottom layer	0.00	Bottom layer	0.68
184:					
Klinger-------------	100	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
198B:					
Floyd---------------	90	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
221:					
Klossner------------	100	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
284B:					
Flagler-------------	90	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.04
		Bottom layer	0.00	Bottom layer	0.08
285:					
Burkhardt-----------	100	Improbable		Fair	
		Thickest layer	0.00	Bottom layer	0.10
		Bottom layer	0.00	Thickest layer	0.10
285C:					
Burkhardt-----------	100	Improbable		Fair	
		Thickest layer	0.00	Bottom layer	0.10
		Bottom layer	0.00	Thickest layer	0.10
323B:					
Fort Dodge----------	85	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.10
344D:					
Copaston------------	90	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.03
344G:					
Copaston------------	85	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.03
354:					
Aquolls, ponded-----	90	Not rated		Not rated	
377B:					
Dinsdale------------	90	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00

Source of Sand and Gravel--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
377C:					
Dinsdale------------	90	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
382:					
Maxfield------------	100	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
391B:					
Clyde---------------	60	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
Floyd---------------	35	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
394B:					
Ostrander-----------	75	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
394C:					
Ostrander-----------	85	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
395B:					
Marquis-------------	80	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
398:					
Tripoli-------------	90	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
399:					
Readlyn-------------	85	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
408B:					
Olin----------------	80	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
471:					
Oran----------------	85	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
485:					
Spillville, occasionally flooded------------	80	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00

Source of Sand and Gravel--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
582B:					
Kasson--------------	90	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
582C:					
Kasson--------------	80	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
585:					
Spillville, occasionally flooded------------	50	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
Coland, occasionally flooded------------	30	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.03
620B:					
Port Byron----------	90	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
620C2:					
Port Byron----------	100	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
626:					
Hayfield, rarely flooded------------	90	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.54
663B:					
Seaton--------------	100	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
663C:					
Seaton--------------	100	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
663D2:					
Seaton, moderately eroded-------------	90	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
663D3:					
Seaton, severely eroded-------------	90	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00

Source of Sand and Gravel--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
663E2:					
Seaton, moderately eroded	90	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
663G:					
Seaton	90	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
775:					
Billett	100	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.04
		Bottom layer	0.00	Bottom layer	0.08
775B:					
Billett	100	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.04
		Bottom layer	0.00	Bottom layer	0.08
775C:					
Billett	100	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.04
		Bottom layer	0.00	Bottom layer	0.08
778:					
Sattre, rarely flooded	85	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.11
813B:					
Atkinson	90	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
813C:					
Atkinson	85	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
814B:					
Rockton	90	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
814C:					
Rockton	85	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
814D:					
Rockton	90	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
884:					
Klingmore	100	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00

Source of Sand and Gravel--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
930:					
Orion, occasionally flooded-----------	100	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
982:					
Maxmore-------------	100	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
1152:					
Marshan, rarely flooded-----------	75	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.29
		Bottom layer	0.00	Bottom layer	0.82
1226:					
Lawler, rarely flooded-----------	80	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.82
1585:					
Spillville, channeled----------	40	Improbable		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
Coland, channeled---	35	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.03
Aquolls, ponded-----	15	Not rated		Not rated	
1586:					
Sigglekov, frequently flooded	55	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.41
		Bottom layer	0.00	Bottom layer	0.52
Fluvaquents, frequently flooded	30	Not rated		Not rated	
Aquents, ponded-----	15	Not rated		Not rated	
4946:					
Udorthents----------	65	Not rated		Not rated	
Interstate highway--	35	Not rated		Not rated	
5010:					
Pits, sand and gravel------------	100	Not rated		Not rated	
5030:					
Pits, limestone quarries-----------	100	Not rated		Not rated	

Source of Sand and Gravel--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of gravel		Potential as source of sand	
		Rating class	Value	Rating class	Value
5040:					
Udorthents, loamy---	100	Not rated		Not rated	
5080:					
Udorthents, sanitary landfill-----------	100	Not rated		Not rated	
8041:					
Sparta, terrace, rarely flooded-----	80	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.27
		Bottom layer	0.00	Bottom layer	0.35
8041B:					
Sparta, terrace, rarely flooded-----	80	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.27
		Bottom layer	0.00	Bottom layer	0.35
8175B:					
Dickinson, terrace, rarely flooded-----	100	Improbable		Fair	
		Thickest layer	0.00	Thickest layer	0.00
		Bottom layer	0.00	Bottom layer	0.36
AW:					
Animal waste lagoon	100	Not rated		Not rated	
SL:					
Sewage lagoon-------	100	Not rated		Not rated	
W:					
Water---------------	100	Not rated		Not rated	

Source of Reclamation Material, Roadfill, and Topsoil

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.00 to 0.99. The smaller the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material		Potential as source of roadfill		Potential as source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
41B:							
Sparta	80	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Wind erosion	0.00			Rock fragments	0.95
		Low content of organic matter	0.12				
41C:							
Sparta	80	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Wind erosion	0.00			Rock fragments	0.95
		Low content of organic matter	0.12				
43:							
Bremer	100	Fair		Poor		Poor	
		Too clayey	0.05	Wetness	0.00	Wetness	0.00
		Water erosion	0.90	Low strength	0.00	Too clayey	0.04
		Too acid	0.95	Shrink-swell	0.44		
50B:							
Coloma	85	Poor		Good		Poor	
		Wind erosion	0.00			Too sandy	0.00
		Too sandy	0.00				
		Low content of organic matter	0.12				
63B:							
Chelsea	90	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Wind erosion	0.00				
		Low content of organic matter	0.12				
63C:							
Chelsea	85	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Wind erosion	0.00				
		Low content of organic matter	0.12				
63E:							
Chelsea	85	Poor		Fair		Poor	
		Too sandy	0.00	Slope	0.98	Too sandy	0.00
		Wind erosion	0.00			Slope	0.00
		Low content of organic matter	0.12				
83B:							
Kenyon	75	Fair		Fair		Fair	
		Low content of organic matter	0.50	Low strength	0.78	Rock fragments	0.59
		Too acid	0.97				

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material		Potential as source of roadfill		Potential as source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
83C:							
Kenyon--------------	75	Fair		Fair		Fair	
		Low content of organic matter	0.50	Low strength	0.78	Rock fragments	0.59
		Too acid	0.97				
84:							
Clyde---------------	80	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
				Shrink-swell	0.99	Rock fragments	0.98
		Water erosion	0.99				
109B:							
Backbone------------	100	Fair		Poor		Fair	
		Droughty	0.16	Depth to bedrock	0.00	Depth to bedrock	0.54
		Depth to bedrock	0.54			Rock fragments	0.99
		Too acid	0.74				
109C:							
Backbone------------	100	Fair		Poor		Fair	
		Droughty	0.16	Depth to bedrock	0.00	Depth to bedrock	0.54
		Depth to bedrock	0.54			Rock fragments	0.99
		Too acid	0.74				
109D:							
Backbone------------	100	Fair		Poor		Fair	
		Droughty	0.16	Depth to bedrock	0.00	Slope	0.37
		Depth to bedrock	0.54			Depth to bedrock	0.54
		Too acid	0.74			Rock fragments	0.99
127:							
Plano, rarely flooded-----------	85	Fair		Poor		Fair	
		Too clayey	0.82	Low strength	0.00	Too clayey	0.59
		Low content of organic matter	0.88	Shrink-swell	0.95		
		Water erosion	0.90				
135:							
Coland, occasionally flooded-----------	85	Fair		Poor		Poor	
		Too clayey	0.98	Wetness	0.00	Wetness	0.00
				Low strength	0.00	Too clayey	0.98
153:							
Shandep, ponded, occasionally flooded-----------	75	Good		Poor		Poor	
				Wetness	0.00	Wetness	0.00
				Low strength	0.00		
173:							
Hoopeston, rarely flooded-----------	100	Fair		Poor		Poor	
		Low content of organic matter	0.68	Wetness	0.00	Wetness	0.00
		Too acid	0.97				

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material: Rating class and limiting features	Value	Potential as source of roadfill: Rating class and limiting features	Value	Potential as source of topsoil: Rating class and limiting features	Value
175B:							
Dickinson-----------	90	Fair		Good		Good	
		Low content of organic matter	0.12				
		Too acid	0.84				
		Droughty	0.95				
175C:							
Dickinson-----------	100	Fair		Good		Good	
		Low content of organic matter	0.12				
		Too acid	0.84				
		Droughty	0.95				
178:							
Waukee, rarely flooded-----------	85	Fair		Good		Fair	
		Low content of organic matter	0.12			Rock fragments	0.50
		Too acid	0.74				
178B:							
Waukee, rarely flooded-----------	95	Fair		Good		Fair	
		Low content of organic matter	0.12			Rock fragments	0.50
		Too acid	0.74				
178C:							
Waukee, rarely flooded-----------	95	Fair		Good		Fair	
		Low content of organic matter	0.12			Rock fragments	0.50
		Too acid	0.74				
184:							
Klinger-------------	100	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
				Low strength	0.00		
		Too acid	0.84				
		Water erosion	0.90				
198B:							
Floyd---------------	90	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
				Low strength	0.78		
221:							
Klossner------------	100	Poor		Poor		Not rated	
		Wind erosion	0.00	Wetness	0.00		
		Too acid	0.97	Low strength	0.00		
284B:							
Flagler-------------	90	Fair		Good		Fair	
		Low content of organic matter	0.12			Rock fragments	0.99
		Too acid	0.84				
		Droughty	0.87				

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material		Potential as source of roadfill		Potential as source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
285:							
Burkhardt-----------	100	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Droughty	0.09			Rock fragments	0.00
		Low content of organic matter	0.12			Hard to reclaim (rock fragments)	0.26
285C:							
Burkhardt-----------	100	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Droughty	0.09			Rock fragments	0.00
		Low content of organic matter	0.12			Hard to reclaim (rock fragments)	0.26
323B:							
Fort Dodge----------	85	Good		Poor		Good	
				Low strength	0.00		
344D:							
Copaston------------	90	Poor		Poor		Poor	
		Depth to bedrock	0.00	Depth to bedrock	0.00	Depth to bedrock	0.00
		Droughty	0.00			Rock fragments	0.82
						Slope	0.96
344G:							
Copaston------------	85	Poor		Poor		Poor	
		Depth to bedrock	0.00	Depth to bedrock	0.00	Depth to bedrock	0.00
		Droughty	0.00	Slope	0.50	Slope	0.00
						Rock fragments	0.82
354:							
Aquolls, ponded-----	90	Not rated		Not rated		Not rated	
377B:							
Dinsdale------------	90	Fair		Poor		Fair	
		Low content of organic matter	0.12	Low strength	0.00	Too clayey	0.76
				Shrink-swell	0.99		
		Water erosion	0.90				
		Too clayey	0.92				
377C:							
Dinsdale------------	90	Fair		Poor		Fair	
		Low content of organic matter	0.12	Low strength	0.00	Too clayey	0.76
				Shrink-swell	0.99		
		Water erosion	0.90				
		Too clayey	0.92				
382:							
Maxfield------------	100	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
				Low strength	0.00	Too clayey	0.98
		Too clayey	0.98	Shrink-swell	0.99		
391B:							
Clyde---------------	60	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
				Shrink-swell	0.99	Rock fragments	0.98
		Water erosion	0.99				

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material: Rating class and limiting features	Value	Potential as source of roadfill: Rating class and limiting features	Value	Potential as source of topsoil: Rating class and limiting features	Value
391B:							
Floyd	35	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
				Low strength	0.78		
394B:							
Ostrander	75	Fair		Poor		Good	
		Low content of organic matter	0.12	Low strength	0.00		
		Too acid	0.97				
		Water erosion	0.99				
394C:							
Ostrander	85	Fair		Poor		Good	
		Low content of organic matter	0.12	Low strength	0.00		
		Too acid	0.97				
		Water erosion	0.99				
395B:							
Marquis	80	Fair		Fair		Fair	
		Low content of organic matter	0.50	Wetness	0.53	Wetness	0.53
						Rock fragments	0.88
		Too acid	0.97				
		Water erosion	0.99				
398:							
Tripoli	90	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
				Low strength	0.78	Rock fragments	0.82
399:							
Readlyn	85	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
						Rock fragments	0.82
		Too acid	0.84				
408B:							
Olin	80	Fair		Fair		Good	
		Low content of organic matter	0.12	Low strength	0.78		
		Too acid	0.74				
		Water erosion	0.99				
471:							
Oran	85	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
						Rock fragments	0.76
		Too acid	0.84				
		Water erosion	0.99				
485:							
Spillville, occasionally flooded	80	Good		Poor		Poor	
				Wetness	0.00	Wetness	0.00
				Low strength	0.22		

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material: Rating class and limiting features	Value	Potential as source of roadfill: Rating class and limiting features	Value	Potential as source of topsoil: Rating class and limiting features	Value
582B:							
Kasson--------------	90	Fair		Fair		Fair	
		Low content of organic matter	0.12	Wetness	0.53	Wetness	0.53
		Too acid	0.88	Low strength	0.78	Rock fragments	0.82
582C:							
Kasson--------------	80	Fair		Fair		Fair	
		Low content of organic matter	0.12	Wetness	0.53	Wetness	0.53
		Too acid	0.88	Low strength	0.78	Rock fragments	0.82
585:							
Spillville, occasionally flooded------------	50	Good		Poor		Poor	
				Wetness	0.00	Wetness	0.00
				Low strength	0.22		
Coland, occasionally flooded------------	30	Fair		Poor		Poor	
		Too clayey	0.98	Wetness	0.00	Wetness	0.00
				Low strength	0.00	Too clayey	0.98
620B:							
Port Byron----------	90	Fair		Good		Good	
		Low content of organic matter	0.50				
		Water erosion	0.99				
620C2:							
Port Byron----------	100	Fair		Poor		Good	
		Low content of organic matter	0.50	Low strength	0.00		
		Water erosion	0.99				
626:							
Hayfield, rarely flooded------------	90	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
		Too acid	0.74				
663B:							
Seaton--------------	100	Fair		Poor		Good	
		Low content of organic matter	0.12	Low strength	0.00		
		Too acid	0.97				
		Water erosion	0.99				
663C:							
Seaton--------------	100	Fair		Poor		Good	
		Low content of organic matter	0.12	Low strength	0.00		
		Too acid	0.97				
		Water erosion	0.99				

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material		Potential as source of roadfill		Potential as source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
663D2:							
Seaton, moderately eroded	90	Fair		Poor		Fair	
		Low content of organic matter	0.12	Low strength	0.00	Slope	0.37
		Too acid	0.97				
		Water erosion	0.99				
663D3:							
Seaton, severely eroded	90	Fair		Poor		Fair	
		Low content of organic matter	0.12	Low strength	0.00	Slope	0.37
		Too acid	0.97				
		Water erosion	0.99				
663E2:							
Seaton, moderately eroded	90	Fair		Poor		Poor	
		Low content of organic matter	0.12	Low strength	0.00	Slope	0.00
				Slope	0.98		
		Too acid	0.97				
		Water erosion	0.99				
663G:							
Seaton	90	Fair		Poor		Poor	
		Low content of organic matter	0.12	Slope	0.00	Slope	0.00
				Low strength	0.00		
		Too acid	0.97				
		Water erosion	0.99				
775:							
Billett	100	Fair		Good		Good	
		Low content of organic matter	0.12				
		Too acid	0.84				
775B:							
Billett	100	Fair		Good		Good	
		Low content of organic matter	0.12				
		Too acid	0.84				
775C:							
Billett	100	Fair		Good		Good	
		Low content of organic matter	0.12				
		Too acid	0.84				
778:							
Sattre, rarely flooded	85	Fair		Good		Fair	
		Low content of organic matter	0.12			Rock fragments	0.76
		Too acid	0.84				

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material: Rating class and limiting features	Value	Potential as source of roadfill: Rating class and limiting features	Value	Potential as source of topsoil: Rating class and limiting features	Value
813B:							
Atkinson	90	Fair		Poor		Fair	
		Too acid	0.74	Low strength	0.00	Rock fragments	0.88
				Depth to bedrock	0.58		
				Shrink-swell	0.92		
813C:							
Atkinson	85	Fair		Poor		Fair	
		Too acid	0.74	Low strength	0.00	Rock fragments	0.88
				Depth to bedrock	0.58		
				Shrink-swell	0.92		
814B:							
Rockton	90	Fair		Poor		Fair	
		Depth to bedrock	0.65	Depth to bedrock	0.00	Depth to bedrock	0.65
		Too acid	0.84	Low strength	0.00		
		Low content of organic matter	0.88	Shrink-swell	0.96		
814C:							
Rockton	85	Fair		Poor		Fair	
		Depth to bedrock	0.65	Depth to bedrock	0.00	Depth to bedrock	0.65
		Too acid	0.84	Low strength	0.00		
		Low content of organic matter	0.88	Shrink-swell	0.96		
814D:							
Rockton	90	Fair		Poor		Fair	
		Depth to bedrock	0.65	Depth to bedrock	0.00	Slope	0.37
		Too acid	0.84	Low strength	0.00	Depth to bedrock	0.65
		Low content of organic matter	0.88	Shrink-swell	0.96		
884:							
Klingmore	100	Fair		Poor		Poor	
		Too acid	0.84	Wetness	0.00	Wetness	0.00
		Low content of organic matter	0.88	Low strength	0.00	Too clayey	0.70
				Shrink-swell	0.92		
		Too clayey	0.98				
930:							
Orion, occasionally flooded	100	Fair		Poor		Poor	
		Water erosion	0.99	Wetness	0.00	Wetness	0.00
				Low strength	0.22		
982:							
Maxmore	100	Fair		Poor		Poor	
		Too clayey	0.92	Wetness	0.00	Wetness	0.00
				Low strength	0.00	Too clayey	0.76
				Shrink-swell	0.90		
1152:							
Marshan, rarely flooded	75	Poor		Poor		Poor	
		Too sandy	0.00	Wetness	0.00	Too sandy	0.00
		Low content of organic matter	0.12			Wetness	0.00
						Hard to reclaim (rock fragments)	0.12

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material: Rating class and limiting features	Value	Potential as source of roadfill: Rating class and limiting features	Value	Potential as source of topsoil: Rating class and limiting features	Value
1226:							
Lawler, rarely flooded	80	Fair		Poor		Poor	
		Low content of organic matter	0.12	Wetness	0.00	Wetness	0.00
		Too acid	0.84			Hard to reclaim (rock fragments)	0.12
						Rock fragments	0.68
1585:							
Spillville, channeled	40	Good		Poor		Poor	
				Wetness	0.00	Wetness	0.00
				Low strength	0.22		
Coland, channeled	35	Fair		Poor		Poor	
		Too clayey	0.98	Wetness	0.00	Wetness	0.00
				Low strength	0.00	Too clayey	0.98
Aquolls, ponded	15	Not rated		Not rated		Not rated	
1586:							
Sigglekov, frequently flooded	55	Poor		Poor		Poor	
		Too sandy	0.00	Wetness	0.00	Too sandy	0.00
		Droughty	0.04			Wetness	0.00
		Low content of organic matter	0.12			Rock fragments	0.92
Fluvaquents, frequently flooded	30	Not rated		Not rated		Not rated	
Aquents, ponded	15	Not rated		Not rated		Not rated	
4946:							
Udorthents	65	Not rated		Not rated		Not rated	
Interstate highway	35	Not rated		Not rated		Not rated	
5010:							
Pits, sand and gravel	100	Not rated		Not rated		Not rated	
5030:							
Pits, limestone quarries	100	Not rated		Not rated		Not rated	
5040:							
Udorthents, loamy	100	Not rated		Not rated		Not rated	
5080:							
Udorthents, sanitary landfill	100	Not rated		Not rated		Not rated	
8041:							
Sparta, terrace, rarely flooded	80	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Wind erosion	0.00			Rock fragments	0.95
		Low content of organic matter	0.12				

Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	Potential as source of reclamation material		Potential as source of roadfill		Potential as source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
8041B:							
Sparta, terrace, rarely flooded-----	80	Poor		Good		Poor	
		Too sandy	0.00			Too sandy	0.00
		Wind erosion	0.00			Rock fragments	0.95
		Low content of organic matter	0.12				
8175B:							
Dickinson, terrace, rarely flooded-----	100	Fair		Good		Good	
		Low content of organic matter	0.12				
		Too acid	0.84				
		Droughty	0.95				
AW:							
Animal waste lagoon	100	Not rated		Not rated		Not rated	
SL:							
Sewage lagoon-------	100	Not rated		Not rated		Not rated	
W:							
Water---------------	100	Not rated		Not rated		Not rated	

Water Management

The table “Ponds and Embankments” gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Ponds and Embankments

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
41B:							
Sparta	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.35	Depth to water	1.00
		Slope	0.08				
41C:							
Sparta	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.35	Depth to water	1.00
		Slope	0.92				
43:							
Bremer	100	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Hard to pack	0.14		
50B:							
Coloma	85	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.75	Depth to water	1.00
63B:							
Chelsea	90	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.12	Depth to water	1.00
		Slope	0.08				
63C:							
Chelsea	85	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.12	Depth to water	1.00
		Slope	0.92				
63E:							
Chelsea	85	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Seepage	0.12	Depth to water	1.00
		Seepage	1.00				
83B:							
Kenyon	75	Not limited		Somewhat limited		Very limited	
				Piping	0.33	Slow refill	1.00
						Depth to saturated zone	0.81
						Cutbanks cave	0.10
83C:							
Kenyon	75	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.92	Piping	0.33	Slow refill	1.00
						Depth to saturated zone	0.81
						Cutbanks cave	0.10
84:							
Clyde	80	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Piping	0.06		

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas: Rating class and limiting features	Value	Embankments, dikes, and levees: Rating class and limiting features	Value	Aquifer-fed excavated ponds: Rating class and limiting features	Value
109B:							
Backbone------------	100	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Thin layer	0.86	Depth to water	1.00
		Depth to bedrock	0.86	Seepage	0.06		
		Slope	0.08				
109C:							
Backbone------------	100	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Thin layer	0.86	Depth to water	1.00
		Slope	0.92	Seepage	0.06		
		Depth to bedrock	0.86				
109D:							
Backbone------------	100	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Thin layer	0.86	Depth to water	1.00
		Seepage	1.00	Seepage	0.06		
		Depth to bedrock	0.86				
127:							
Plano, rarely flooded------------	85	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.33	Depth to water	1.00
				Piping	0.17		
135:							
Coland, occasionally flooded------------	85	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Piping	0.08		
				Seepage	0.03		
153:							
Shandep, ponded, occasionally flooded------------	75	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	1.00
				Ponding	1.00		
				Piping	0.73		
173:							
Hoopeston, rarely flooded------------	100	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	1.00
				Seepage	0.31		
175B:							
Dickinson-----------	90	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.36	Depth to water	1.00
		Slope	0.08				
175C:							
Dickinson-----------	100	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.36	Depth to water	1.00
		Slope	0.92				

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas: Rating class and limiting features	Value	Embankments, dikes, and levees: Rating class and limiting features	Value	Aquifer-fed excavated ponds: Rating class and limiting features	Value
178:							
Waukee, rarely flooded	85	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.68	Depth to water	1.00
178B:							
Waukee, rarely flooded	95	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.68	Depth to water	1.00
		Slope	0.08				
178C:							
Waukee, rarely flooded	95	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.68	Depth to water	1.00
		Slope	0.92				
184:							
Klinger	100	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Piping	0.14		
198B:							
Floyd	90	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Piping	0.54		
221:							
Klossner	100	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.19	Depth to saturated zone	1.00	Slow refill	0.81
						Cutbanks cave	0.10
284B:							
Flagler	90	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.08	Depth to water	1.00
285:							
Burkhardt	100	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.10	Depth to water	1.00
285C:							
Burkhardt	100	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.10	Depth to water	1.00
		Slope	0.32				
323B:							
Fort Dodge	85	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Piping	0.93	Depth to water	1.00
				Seepage	0.10		
344D:							
Copaston	90	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Slope	1.00	Seepage	0.03		
		Seepage	0.19				

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas: Rating class and limiting features	Value	Embankments, dikes, and levees: Rating class and limiting features	Value	Aquifer-fed excavated ponds: Rating class and limiting features	Value
344G:							
Copaston------------	85	Very limited		Very limited		Very limited	
		Slope	1.00	Thin layer	1.00	Depth to water	1.00
		Depth to bedrock	1.00	Seepage	0.03		
		Seepage	0.19				
354:							
Aquolls, ponded-----	90	Not limited		Not rated		Not rated	
377B:							
Dinsdale------------	90	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.14	Piping	0.05	Slow refill	1.00
						Depth to saturated zone	0.81
						Cutbanks cave	0.10
377C:							
Dinsdale------------	90	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.92	Piping	0.05	Slow refill	1.00
		Seepage	0.14			Depth to saturated zone	0.81
						Cutbanks cave	0.10
382:							
Maxfield------------	100	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
				Piping	0.02	Cutbanks cave	0.10
391B:							
Clyde---------------	60	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
				Piping	0.06	Cutbanks cave	0.10
Floyd---------------	35	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
				Piping	0.54	Cutbanks cave	0.10
394B:							
Ostrander-----------	75	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.14	Piping	0.23	Depth to water	1.00
		Slope	0.08				
394C:							
Ostrander-----------	85	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.68	Piping	0.23	Depth to water	1.00
		Seepage	0.14				
395B:							
Marquis-------------	80	Somewhat limited		Very limited		Very limited	
		Seepage	0.14	Depth to saturated zone	0.99	Slow refill	1.00
				Piping	0.47	Cutbanks cave	0.10
						Depth to saturated zone	0.01

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas: Rating class and limiting features	Value	Embankments, dikes, and levees: Rating class and limiting features	Value	Aquifer-fed excavated ponds: Rating class and limiting features	Value
398:							
Tripoli	90	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Piping	0.09		
399:							
Readlyn	85	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Piping	0.35		
408B:							
Olin	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Piping	0.79	Depth to water	1.00
		Slope	0.08				
471:							
Oran	85	Not limited		Very limited		Somewhat limited	
				Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Piping	0.27		
485:							
Spillville, occasionally flooded	80	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Piping	0.69		
582B:							
Kasson	90	Somewhat limited		Very limited		Very limited	
		Seepage	0.14	Depth to saturated zone	0.99	Slow refill	1.00
		Slope	0.08			Cutbanks cave	0.10
				Piping	0.40	Depth to saturated zone	0.01
582C:							
Kasson	80	Somewhat limited		Very limited		Very limited	
		Slope	0.92	Depth to saturated zone	0.99	Slow refill	1.00
		Seepage	0.14			Cutbanks cave	0.10
				Piping	0.40	Depth to saturated zone	0.01
585:							
Spillville, occasionally flooded	50	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Piping	0.69		
Coland, occasionally flooded	30	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Piping	0.08		
				Seepage	0.03		

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
620B:							
Port Byron----------	90	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.14	Piping	0.94	Depth to water	1.00
		Slope	0.08				
620C2:							
Port Byron----------	100	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.92	Piping	0.90	Depth to water	1.00
		Seepage	0.14				
626:							
Hayfield, rarely flooded------------	90	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	1.00
				Seepage	0.54		
663B:							
Seaton--------------	100	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.14	Piping	0.97	Depth to water	1.00
663C:							
Seaton--------------	100	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.92	Piping	0.97	Depth to water	1.00
		Seepage	0.14				
663D2:							
Seaton, moderately eroded-------------	90	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Piping	0.96	Depth to water	1.00
		Seepage	0.14				
663D3:							
Seaton, severely eroded-------------	90	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Piping	0.97	Depth to water	1.00
		Seepage	0.14				
663E2:							
Seaton, moderately eroded-------------	90	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Piping	0.96	Depth to water	1.00
		Seepage	0.14				
663G:							
Seaton--------------	90	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Piping	0.96	Depth to water	1.00
		Seepage	0.14				
775:							
Billett-------------	100	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.08	Depth to water	1.00
775B:							
Billett-------------	100	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.08	Depth to water	1.00
		Slope	0.08				

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
775C:							
Billett-------------	100	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.08	Depth to water	1.00
		Slope	0.92				
778:							
Sattre, rarely flooded-----------	85	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.11	Depth to water	1.00
813B:							
Atkinson------------	90	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.19	Thin layer	0.11	Depth to water	1.00
		Depth to bedrock	0.10	Piping	0.01		
813C:							
Atkinson------------	85	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.92	Thin layer	0.11	Depth to water	1.00
		Seepage	0.19	Piping	0.01		
		Depth to bedrock	0.10				
814B:							
Rockton-------------	90	Somewhat limited		Somewhat limited		Very limited	
		Depth to bedrock	0.83	Thin layer	0.83	Depth to water	1.00
		Seepage	0.19	Piping	0.04		
814C:							
Rockton-------------	85	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.92	Thin layer	0.83	Depth to water	1.00
		Depth to bedrock	0.83	Piping	0.04		
		Seepage	0.19				
814D:							
Rockton-------------	90	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Thin layer	0.83	Depth to water	1.00
		Depth to bedrock	0.83	Piping	0.04		
		Seepage	0.19				
884:							
Klingmore-----------	100	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Piping	0.01		
930:							
Orion, occasionally flooded-----------	100	Somewhat limited		Very limited		Very limited	
		Seepage	0.14	Depth to saturated zone	1.00	Cutbanks cave	1.00
						Slow refill	0.86
				Piping	1.00		
982:							
Maxmore-------------	100	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas: Rating class and limiting features	Value	Embankments, dikes, and levees: Rating class and limiting features	Value	Aquifer-fed excavated ponds: Rating class and limiting features	Value
1152:							
Marshan, rarely flooded	75	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	1.00
				Seepage	0.82		
1226:							
Lawler, rarely flooded	80	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	1.00
				Seepage	0.82		
1585:							
Spillville, channeled	40	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Piping	0.78		
Coland, channeled	35	Somewhat limited		Very limited		Somewhat limited	
		Seepage	0.14	Depth to saturated zone	1.00	Slow refill	0.86
						Cutbanks cave	0.10
				Piping	0.08		
				Seepage	0.03		
Aquolls, ponded	15	Not limited		Not rated		Not rated	
1586:							
Sigglekov, frequently flooded	55	Very limited		Very limited		Very limited	
		Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	1.00
				Seepage	0.52		
Fluvaquents, frequently flooded	30	Not limited		Not rated		Not rated	
Aquents, ponded	15	Not limited		Not rated		Not rated	
4946:							
Udorthents	65	Not limited		Not rated		Not rated	
Interstate highway	35	Not rated		Not rated		Not rated	
5010:							
Pits, sand and gravel	100	Not rated		Not rated		Not rated	
5030:							
Pits, limestone quarries	100	Not rated		Not rated		Not rated	
5040:							
Udorthents, loamy	100	Not rated		Not rated		Not rated	

Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
5080:							
Udorthents, sanitary landfill-----------	100	Not rated		Not rated		Not rated	
8041:							
Sparta, terrace, rarely flooded-----	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.35	Depth to water	1.00
8041B:							
Sparta, terrace, rarely flooded-----	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.35	Depth to water	1.00
8175B:							
Dickinson, terrace, rarely flooded-----	100	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.36	Depth to water	1.00
		Slope	0.08				
AW:							
Animal waste lagoon	100	Not rated		Not rated		Not rated	
SL:							
Sewage lagoon-------	100	Not rated		Not rated		Not rated	
W:							
Water---------------	100	Not rated		Not rated		Not rated	

Soil Properties

Data relating to soil properties are collected during the course of the soil survey.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine particle-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include engineering index properties, physical and chemical properties, and pertinent soil and water features.

Engineering Properties

The table described in this section gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary in Part I.

Classification of the soils is determined according to the Unified soil classification system (ASTM) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487–00.

Engineering Properties

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
41B:												
Sparta----------	0-8	Loamy fine sand, fine sand, loamy sand, sand	SM, SC-SM	A-2-4	0	0	86-100	72-100	66-98	18-33	0-25	NP-6
	8-15	Loamy fine sand, fine sand, loamy sand, sand	SM, SC-SM	A-2-4	0	0	86-100	72-100	66-98	18-33	0-22	NP-6
	15-72	Fine sand, loamy fine sand, loamy sand, sand	SP-SM, SC-SM	A-2-4, A-3	0	0	87-100	75-100	68-98	7-17	0-20	NP-4
	72-80	Loamy fine sand, fine sand, sand	SP-SM, SC-SM	A-3, A-2-4	0	0	88-100	76-100	70-100	7-18	0-20	NP-5
41C:												
Sparta----------	0-8	Loamy fine sand, fine sand, loamy sand, sand, loamy fine sand	SM, SC-SM	A-2-4	0	0	86-100	72-100	66-98	18-33	0-25	NP-6
	8-15	Loamy fine sand, fine sand, loamy sand, sand	SM, SC-SM	A-2-4	0	0	86-100	72-100	66-98	18-33	0-22	NP-6
	15-72	Fine sand, loamy fine sand, loamy sand, sand	SP-SM, SC-SM	A-2-4, A-3	0	0	87-100	75-100	68-98	7-17	0-20	NP-4
	72-80	Loamy fine sand, fine sand, sand	SP-SM, SC-SM	A-2-4, A-3	0	0	88-100	76-100	70-100	7-18	0-20	NP-5
43:												
Bremer----------	0-8	Silty clay loam	MH, ML	A-7-5, A-7-6	0	0	100	100	95-100	84-93	47-60	18-25
	8-19	Silty clay loam	MH, ML	A-7-5, A-7-6	0	0	100	100	95-100	84-93	45-58	18-25
	19-42	Silty clay loam, silty clay	CH, CL	A-7-6	0	0	100	100	93-100	82-89	47-56	25-30
	42-60	Silty clay loam	CL	A-7-6	0	0	100	100	96-100	86-92	43-50	23-27
50B:												
Coloma----------	0-8	Loamy sand	SM, SC-SM	A-2-4	0	0	84-100	84-100	61-82	16-29	0-25	NP-6
	8-39	Sand, fine sand, loamy fine sand, loamy sand	SP-SM, SC	A-2-4, A-3	0	0	85-100	84-100	63-89	6-21	0-26	NP-9
	39-80	Loamy sand, sand, sandy loam	SM, SP-SM, SC	A-2-4, A-3	0	0	85-100	84-100	62-87	6-22	0-25	NP-9

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
63B:												
Chelsea---------	0-8	Loamy fine sand, fine sand	SC-SM, SC	A-2-4	0	0	100	100	92-99	23-30	20-28	4-9
	8-15	Fine sand, loamy fine sand	SC-SM, SM	A-2-4	0	0	100	100	91-96	15-20	16-21	2-6
	15-36	Fine sand, loamy fine sand	SC-SM, SM	A-2-4	0	0	100	100	91-96	15-20	16-21	2-6
	36-70	Fine sand, loamy fine sand, loamy sand, fine sandy loam, sandy loam	SC-SM, SM	A-2-4	0	0	100	100	91-96	15-20	16-21	2-6
63C:												
Chelsea---------	0-8	Loamy fine sand, fine sand	SC-SM, SC	A-2-4	0	0	100	100	92-99	23-30	20-28	4-9
	8-15	Fine sand, loamy fine sand	SC-SM, SM	A-2-4	0	0	100	100	91-96	15-20	16-21	2-6
	15-36	Fine sand, loamy fine sand	SC-SM, SM	A-2-4	0	0	100	100	91-96	15-20	16-21	2-6
	36-70	Sandy loam, fine sand, loamy fine sand, loamy sand, fine sandy loam	SC-SM, SM	A-2-4	0	0	100	100	66-71	15-20	16-21	2-6
63E:												
Chelsea---------	0-8	Loamy fine sand, fine sand	SC-SM, SC	A-2-4	0	0	100	100	92-99	23-30	20-28	4-9
	8-15	Fine sand, loamy fine sand	SC-SM, SM	A-2-4	0	0	100	100	91-96	15-20	16-21	2-6
	15-36	Fine sand, loamy fine sand	SC-SM, SM	A-2-4	0	0	100	100	91-96	15-20	16-21	2-6
	36-70	Sandy loam, fine sand, loamy fine sand, loamy sand, fine sandy loam	SC-SM, SM	A-2-4	0	0	100	100	66-71	15-20	16-21	2-6
83B:												
Kenyon----------	0-8	Loam, silt loam	CL	A-6, A-7-6	0	0	100	95-100	80-93	58-70	34-44	11-18
	8-14	Loam, silt loam	CL	A-6, A-7-6	0	0	100	95-100	80-93	58-70	32-42	12-18
	14-19	Loam, sandy clay loam, silt loam	CL	A-6, A-7-6	0	0	100	95-100	80-93	58-70	29-42	12-18
	19-55	Loam, clay loam, sandy clay loam	CL, SC	A-6, A-7-6	0	0-5	89-95	73-90	62-86	46-65	29-42	13-21
	55-79	Loam	CL, SC	A-6	0	0-4	90-95	75-91	65-83	48-62	29-35	13-16

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
83C:												
Kenyon----------	0-8	Loam, silt loam	CL	A-6, A-7-6	0	0	100	95-100	80-93	58-70	34-44	11-18
	8-14	Loam, silt loam	CL	A-6, A-7-6	0	0	100	95-100	80-93	58-70	32-42	12-18
	14-19	Loam, sandy clay loam, silt loam	CL	A-6, A-7-6	0	0	100	95-100	80-93	58-70	29-42	12-18
	19-55	Loam, clay loam, sandy clay loam	CL, SC	A-6, A-7-6	0	0-5	89-95	73-90	62-86	46-65	29-42	13-21
	55-79	Loam	CL, SC	A-6	0	0-4	90-95	75-91	65-83	48-62	29-35	13-16
84:												
Clyde-----------	0-8	Silty clay loam, clay loam, loam	MH, ML	A-7-5	0	0-5	94-100	89-100	84-100	74-91	47-61	17-22
	8-17	Silty clay loam, clay loam	MH, CL, ML	A-7-6, A-7-5	0	0-5	94-100	89-100	86-100	77-90	42-54	19-22
	17-23	Silty clay loam, clay loam	CL	A-7-6, A-6	0	0-5	94-100	89-100	86-100	77-90	40-50	19-22
	23-28	Clay loam, silty clay loam	CL	A-7-6, A-6	0	0-5	95-100	84-95	73-91	63-79	32-44	15-21
	28-41	Silty clay loam, clay loam	CL	A-7-6, A-6	0	0-5	95-100	84-95	77-95	68-85	32-44	15-21
	41-44	Sandy loam, loam	SC, SC-SM	A-2-4, A-4	0	1-4	85-95	71-91	52-71	25-36	21-27	6-9
	44-62	Loam, clay loam	CL, SC	A-6	0	1-4	90-95	75-91	65-85	48-65	29-39	13-19
	62-66	Loam, clay loam	CL, SC	A-6	0	1-4	90-95	75-91	65-85	48-65	29-39	13-19
109B:												
Backbone--------	0-8	Sandy loam	SC, SC-SM	A-4, A-2-4, A-6	0	0	100	100	72-82	34-44	21-32	4-12
	8-24	Sandy loam, loamy fine sand	SC, SC-SM	A-2-4, A-2-6	0	0-1	91-95	86-95	62-74	26-35	23-29	7-12
	24-30	Clay loam, sandy clay loam, clay	CL, SC, CH	A-7-6, A-6	0	1-9	87-97	74-97	55-91	40-71	29-51	13-29
	30-80	Bedrock	---	---	---	---	---	---	---	---	---	---
109C:												
Backbone--------	0-8	Sandy loam	SC, SC-SM	A-4, A-2-4, A-6	0	0	100	100	72-82	34-44	21-32	4-12
	8-24	Sandy loam, loamy fine sand	SC, SC-SM	A-2-4, A-2-6	0	0-1	91-95	86-95	62-74	26-35	23-29	7-12
	24-30	Clay loam, sandy clay loam, clay	CL, SC, CH	A-7-6, A-6	0	1-9	87-97	74-97	55-91	40-71	29-51	13-29
	30-80	Bedrock	---	---	---	---	---	---	---	---	---	---

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
109D:												
Backbone--------	0-8	Sandy loam	SC, SC-SM	A-4, A-2-4, A-6	0	0	100	100	72-82	34-44	21-32	4-12
	8-24	Sandy loam, loamy fine sand	SC, SC-SM	A-2-4, A-2-6	0	0-1	91-95	86-95	62-74	26-35	23-29	7-12
	24-30	Clay loam, sandy clay loam, clay	CL, SC, CH	A-7-6, A-6	0	1-9	87-97	74-97	55-91	40-71	29-51	13-29
	30-80	Bedrock	---	---	---	---	---	---	---	---	---	---
127:												
Plano, rarely flooded--------	0-8	Silty clay loam, silt loam	CL, CH	A-7-6, A-6	0	0	100	100	100	90-95	37-54	13-25
	8-14	Silt loam, silty clay loam	CL, CH	A-6, A-7-6	0	0	100	100	100	90-95	31-51	13-25
	14-43	Silty clay loam	CL	A-7-6, A-6	0	0	100	100	95-100	85-95	30-47	13-25
	43-49	Silt loam, silty clay loam	CL	A-6, A-7-6	0	0	100	100	90-100	83-98	35-41	17-21
	49-53	Clay loam	CL, SC	A-6, A-4, A-7-6	0	0	90-100	85-100	60-90	40-75	24-43	9-23
	53-60	Sandy loam	SC, SM	A-2-6, A-1-b, A-6	0	0	90-100	75-100	45-85	20-50	16-30	2-13
	60-72	Sandy loam, loam, loamy sand	SM, SP-SM, SC	A-2-4, A-2-6	0	0	90-100	75-100	60-80	5-20	16-30	2-13
135:												
Coland, occasionally flooded--------	0-8	Clay loam, silty clay loam	MH, ML	A-7-5, A-7-6	0	0	100	100	90-98	78-86	47-59	18-24
	8-32	Silty clay loam, clay loam	MH, CL, ML	A-7-6, A-7-5	0	0	100	100	95-100	84-92	43-57	18-24
	32-40	Clay loam, loam	CL, CH	A-7-6, A-6	0	0	100	100	88-98	72-82	39-53	17-25
	40-44	Sandy loam, clay loam, loam	SC, SC-SM	A-6, A-2-4, A-7-6	0	0	100	89-100	62-86	29-48	22-42	7-19
	44-52	Loam, clay loam, sandy loam	CL, CL-ML	A-6, A-4, A-7-6	0	0	100	89-100	72-97	51-73	22-42	7-19
	52-60	Sandy loam, clay loam, loam	SC, SC-SM	A-6, A-2-4	0	0	100	89-100	62-86	29-48	22-40	7-19

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
153: Shandep, ponded, occasionally flooded--------	0-8	Clay loam	MH	A-7-5	0	0	95-100	89-100	79-94	62-75	51-61	18-22
	8-29	Clay loam	MH	A-7-5	0	0	95-100	89-100	79-94	62-75	51-61	18-22
	29-37	Clay loam, silty clay loam, loam	CL	A-7-6, A-6	0	0	95-100	90-100	78-93	59-71	38-48	18-22
	37-45	Loam, sandy loam	CL-ML, SC-SM	A-4	0	0	96-100	79-100	67-88	44-60	18-23	4-7
	45-60	Loamy sand, gravelly loamy coarse sand, gravelly coarse sand	SM, SP-SM, SC-SM	A-2-4, A-1-b	0	0-4	73-92	50-92	38-75	12-27	0-20	NP-4
173: Hoopeston, rarely flooded	0-8	Sandy loam, loam	SC, SC-SM, CL	A-4	0	0	90-100	81-100	59-83	36-55	23-34	4-11
	8-14	Sandy loam, loam	SC, SC-SM, CL	A-4, A-6	0	0	90-100	81-100	59-83	36-55	23-34	4-11
	14-38	Sandy loam, fine sandy loam	SC, SC-SM	A-4, A-2-4, A-6	0	0	91-100	81-100	60-80	30-43	22-29	7-12
	38-60	Sand, loamy sand, fine sand	SM, SP-SM, SC-SM	A-2-4, A-3	0	0	91-100	82-100	62-84	9-19	0-21	NP-6
175B: Dickinson-------	0-8	Fine sandy loam, sandy loam, loam	SC, SC-SM	A-4, A-6	0	0	100	100	90-96	41-47	25-33	7-11
	8-18	Fine sandy loam, sandy loam, loam	SC, SC-SM	A-4, A-6	0	0	100	100	89-97	39-47	21-33	6-11
	18-30	Fine sandy loam, sandy loam	SC, SC-SM	A-4, A-6	0	0	100	100	89-97	39-47	20-28	6-12
	30-36	Loamy sand, loamy fine sand, sand, fine sand	SM, SC-SM	A-2-4	0	0	100	100	78-83	21-26	16-21	2-6
	36-60	Sand, fine sand, loamy sand, loamy fine sand	SM, SP-SM, SC-SM	A-2-4	0	0	100	100	78-83	12-17	16-21	2-6
175C: Dickinson-------	0-8	Fine sandy loam, sandy loam, loam	SC, SC-SM	A-4, A-6	0	0	100	100	90-96	41-47	25-33	7-11
	8-18	Fine sandy loam, sandy loam, loam	SC, SC-SM	A-4, A-6	0	0	100	100	89-97	39-47	21-33	6-11
	18-30	Fine sandy loam, sandy loam	SC, SC-SM	A-4, A-6	0	0	100	100	89-97	39-47	20-28	6-12
	30-36	Loamy sand, loamy fine sand, sand, fine sand	SM, SC-SM	A-2-4	0	0	100	100	78-83	21-26	16-21	2-6
	36-60	Sand, fine sand, loamy sand, loamy fine sand	SM, SP-SM, SC-SM	A-2-4	0	0	100	100	78-83	12-17	16-21	2-6

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
178:												
Waukee, rarely flooded--------	0-8	Loam, silt loam	CL, ML	A-6, A-7-6	0	0	100	88-100	75-92	54-68	34-42	11-16
	8-18	Loam, silt loam	CL	A-6	0	0	100	88-100	75-92	54-68	32-40	12-16
	18-33	Loam, sandy clay loam	CL, SC	A-6, A-7-6	0	0-3	84-95	68-90	58-84	43-64	28-41	12-19
	33-48	Loamy sand, loamy coarse sand, sand, coarse sand, gravelly loamy coarse sand	SM, SP-SM, SC-SM	A-2-4, A-1-a	0-4	0-10	65-100	29-100	22-81	6-28	0-20	NP-4
	48-80	Sand, loamy sand, loamy coarse sand, coarse sand, gravelly loamy coarse sand	SP-SM, SP, SC-SM	A-2-4, A-1-a	0-4	0-10	65-100	29-100	22-80	2-13	0-20	NP-4
178B:												
Waukee, rarely flooded--------	0-8	Loam, silt loam	CL, ML	A-6, A-7-6	0	0	100	88-100	75-92	54-68	34-42	11-16
	8-18	Loam, silt loam	CL	A-6	0	0	100	88-100	75-92	54-68	32-40	12-16
	18-33	Loam, sandy clay loam	CL, SC	A-6, A-7-6	0	0-3	84-95	68-90	58-84	43-64	28-41	12-19
	33-48	Loamy sand, loamy coarse sand, sand, coarse sand, gravelly loamy coarse sand	SM, SP-SM, SC-SM	A-2-4, A-1-a	0-4	0-10	65-100	29-100	22-81	6-28	0-20	NP-4
	48-80	Sand, loamy sand, loamy coarse sand, coarse sand, gravelly loamy coarse sand	SP-SM, SP, SC-SM	A-2-4, A-1-a	0-4	0-10	65-100	29-100	22-80	2-13	0-20	NP-4
178C:												
Waukee, rarely flooded--------	0-8	Loam, silt loam	CL, ML	A-6, A-7-6	0	0	100	88-100	75-92	54-68	34-42	11-16
	8-18	Loam, silt loam	CL	A-6	0	0	100	88-100	75-92	54-68	32-40	12-16
	18-33	Loam, sandy clay loam	CL, SC	A-6, A-7-6	0	0-3	84-95	68-90	58-84	43-64	28-41	12-19
	33-48	Loamy sand, loamy coarse sand, sand, coarse sand, gravelly loamy coarse sand	SM, SP-SM, SC-SM	A-2-4, A-1-a	0-4	0-10	65-100	29-100	22-81	6-28	0-20	NP-4
	48-80	Sand, loamy sand, loamy coarse sand, coarse sand, gravelly loamy coarse sand	SP-SM, SP, SC-SM	A-2-4, A-1-a	0-4	0-10	65-100	29-100	22-80	2-13	0-20	NP-4

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
184:												
Klinger---------	0-8	Silty clay loam, silt loam	ML, MH	A-7-5, A-7-6	0	0	100	100	96-100	92-97	45-52	17-21
	8-14	Silty clay loam, silt loam	CL, ML	A-7-6, A-6	0	0	100	100	96-100	92-97	39-50	17-21
	14-19	Silty clay loam	CL	A-7-6, A-6	0	0	100	100	98-100	94-97	39-48	19-21
	19-29	Silty clay loam	CL	A-7-6, A-6	0	0	100	100	97-100	93-100	39-49	19-25
	29-59	Loam, clay loam	CL	A-6	0	0-4	90-95	75-91	72-91	58-77	29-39	13-19
	59-79	Loam	CL	A-6	0	0-4	90-95	75-91	72-91	58-77	29-39	13-19
198B:												
Floyd-----------	0-8	Loam, clay loam	ML	A-7-6, A-6, A-7-5	0	0	100	100	87-95	64-72	40-50	13-19
	8-24	Loam, clay loam	ML, CL	A-7-6, A-6	0	0	100	100	87-95	64-72	34-48	13-19
	24-33	Sandy clay loam, loam	SC	A-6, A-2-6	0	1-5	89-95	73-90	60-80	32-45	29-38	12-16
	33-41	Sandy loam, loam, sandy clay loam	SC, SM	A-2-4, A-1-b, A-6	0	1-5	88-94	71-89	48-77	22-44	18-36	3-16
	41-50	Loam, clay loam	CL, SC	A-6, A-7-6	0	1-5	89-95	73-90	61-86	45-66	27-42	12-21
	50-80	Loam, clay loam	CL, SC	A-6, A-7-6	0	1-4	90-96	75-91	63-87	46-67	27-41	12-21
221:												
Klossner--------	0-10	Muck	PT	A-8	0	0	---	---	---	---	---	---
	10-26	Muck	PT	A-8	0	0	---	---	---	---	---	---
	26-36	Mucky silty clay loam, mucky clay loam	OH, ML	A-7-5, A-4	0	0	100	100	86-100	77-97	35-86	9-23
	36-48	Silty clay loam	OH, ML	A-7-5, A-4	0	0	100	100	84-100	75-95	35-86	9-23
	48-65	Clay loam, loam	CL, SM, MH	A-7-6, A-2-4	0	0	90-100	62-100	43-97	33-81	18-55	3-25
	65-80	Loam, clay loam	CL, SM, MH	A-6, A-2-4	0	0	90-100	62-100	46-100	32-79	18-55	3-25
284B:												
Flagler---------	0-8	Sandy loam, fine sandy loam	SC, SC-SM	A-4, A-2-4, A-6	0	0	95-100	84-95	62-76	32-42	25-33	7-11
	8-15	Sandy loam, fine sandy loam	SC, SC-SM	A-4, A-2-4, A-6	0	0	95-100	84-95	76-91	34-45	24-33	7-11
	15-22	Sandy loam	SC, SC-SM	A-2-4, A-6	0	0	95-100	84-95	62-76	31-41	24-33	7-11
	22-33	Sandy loam	SC-SM, SC	A-2-4, A-4	0	0	95-100	84-95	63-76	30-39	20-27	6-9
	33-65	Loamy sand, sand	SM, SC-SM	A-2-4	0	0-1	86-95	71-91	54-75	19-30	0-20	NP-4

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
285:												
Burkhardt-------	0-8	Sandy loam, loam	SC-SM, SM, SC	A-4, A-2-4	0	0	95-100	85-100	59-78	34-48	19-28	2-8
	8-17	Sandy loam	SC-SM, SM, SC	A-4, A-2-4	0	0	95-100	85-100	62-81	30-43	19-28	2-8
	17-19	Loamy sand, gravelly coarse sand, sand	SM, SW-SM	A-2-4, A-1-a	0	0	66-100	37-100	28-81	10-31	0-18	NP-3
	19-29	Stratified sand to gravelly coarse sand, coarse sand	SM, SW-SM	A-2-4, A-1-a	0	0	66-88	37-88	28-65	10-25	0-18	NP-3
	29-60	Stratified sand to gravelly coarse sand, stratified gravelly coarse sand, coarse sand	SM, SW-SM	A-2-4, A-1-a	0	0	66-88	37-88	28-65	10-25	0-18	NP-3
285C:												
Burkhardt-------	0-8	Sandy loam, loam	SC-SM, SM, SC	A-4, A-2-4	0	0	95-100	85-100	59-78	34-48	19-28	2-8
	8-17	Sandy loam	SC-SM, SM, SC	A-4, A-2-4	0	0	95-100	85-100	62-81	30-43	19-28	2-8
	17-19	Loamy sand, gravelly coarse sand, sand	SM, SW-SM	A-2-4, A-1-a	0	0	66-100	37-100	28-81	10-31	0-18	NP-3
	19-29	Stratified sand to gravelly coarse sand, coarse sand	SM, SW-SM	A-2-4, A-1-a	0	0	66-88	37-88	28-65	10-25	0-18	NP-3
	29-60	Stratified sand to gravelly coarse sand, stratified gravelly coarse sand, coarse sand	SM, SW-SM	A-2-4, A-1-a	0	0	66-88	37-88	28-65	10-25	0-18	NP-3
323B:												
Fort Dodge------	0-8	Loam	CL	A-6, A-7-6	0	0-5	100	94-100	82-93	60-70	36-44	13-18
	8-39	Loam	CL	A-6, A-7-6	0	0-5	100	94-100	82-93	60-70	36-44	13-18
	39-58	Loam, clay loam	CL	A-7-6, A-6	0	0-5	100	90-100	77-94	58-72	36-46	15-21
	58-80	Loamy coarse sand, sand, coarse sand, gravelly sand	SM, SC-SM	A-2-4, A-1-b	0	0-9	91-100	81-100	47-64	20-31	0-21	NP-4
344D:												
Copaston--------	0-7	Loam	SC, ML	A-6, A-4, A-7-6	0	0-5	95-100	71-100	56-95	36-66	28-50	9-21
	7-11	Fine sandy loam	SC	A-6, A-2-4	0	0-5	95-100	73-100	66-97	31-48	25-31	9-13
	11-18	Sandy loam	SC, CL	A-2-6, A-2-4, A-7-6	0-1	0-5	91-100	69-100	51-90	26-53	24-41	9-21
	18-80	Bedrock	---	---	---	---	---	---	---	---	---	---

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
344G:												
Copaston--------	0-7	Loam	SC, ML	A-6, A-4, A-7-6	0	0-5	95-100	71-100	56-95	36-66	28-50	9-21
	7-11	Fine sandy loam	SC	A-6, A-2-4	0	0-5	95-100	73-100	66-97	31-48	25-31	9-13
	11-18	Sandy loam	SC, CL	A-2-6, A-2-4, A-7-6	0-1	0-5	91-100	69-100	51-90	26-53	24-41	9-21
	18-80	Bedrock	---	---	---	---	---	---	---	---	---	---
354.												
Aquolls, ponded												
377B:												
Dinsdale--------	0-8	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	96-100	92-96	41-47	17-20
	8-12	Silty clay loam, silt loam	CL	A-7-6, A-6	0	0	100	100	96-100	92-96	39-45	17-20
	12-19	Silty clay loam	CL	A-7-6	0	0	100	100	98-100	94-98	42-48	21-24
	19-34	Silty clay loam	CL	A-7-6	0	0	100	100	98-100	94-98	41-48	21-24
	34-46	Loam, clay loam	CL	A-6	0	0-4	90-95	79-91	76-91	61-77	29-39	13-19
	46-80	Loam, clay loam	CL	A-6	0	0-4	90-95	79-91	76-91	61-77	29-39	13-19
377C:												
Dinsdale--------	0-8	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	96-100	92-96	41-47	17-20
	8-12	Silty clay loam, silt loam	CL	A-7-6, A-6	0	0	100	100	96-100	92-96	39-45	17-20
	12-19	Silty clay loam	CL	A-7-6	0	0	100	100	98-100	94-98	42-48	21-24
	19-34	Silty clay loam	CL	A-7-6	0	0	100	100	98-100	94-98	41-48	21-24
	34-46	Loam, clay loam	CL	A-6	0	0-4	90-95	79-91	76-91	61-77	29-39	13-19
	46-80	Loam, clay loam	CL	A-6	0	0-4	90-95	79-91	76-91	61-77	29-39	13-19
382:												
Maxfield--------	0-8	Silty clay loam	MH, ML	A-7-5	0	0	100	100	95-100	91-99	49-62	18-24
	8-19	Silty clay loam	MH, CL	A-7-5, A-7-6	0	0	100	100	95-100	91-99	43-57	18-24
	19-29	Silty clay loam	CL	A-7-6, A-6	0	0	100	100	95-100	91-100	36-48	17-24
	29-55	Loam, clay loam	CL	A-6, A-7-6	0	0-4	90-95	79-91	74-91	59-82	29-46	13-25
	55-80	Loam, clay loam	CL	A-6, A-7-6	0	0-4	90-95	79-91	74-91	59-82	29-46	13-25

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
391B:												
Clyde-----------	0-8	Silty clay loam, clay loam, loam	MH, ML	A-7-5	0	0-5	94-100	89-100	84-100	74-91	47-61	17-22
	8-17	Silty clay loam, clay loam	MH, CL, ML	A-7-6, A-7-5	0	0-5	94-100	89-100	86-100	77-90	42-54	19-22
	17-23	Silty clay loam, clay loam	CL	A-7-6, A-6	0	0-5	94-100	89-100	86-100	77-90	40-50	19-22
	23-28	Clay loam, silty clay loam	CL	A-7-6, A-6	0	0-5	95-100	84-95	73-91	63-79	32-44	15-21
	28-41	Silty clay loam, clay loam	CL	A-7-6, A-6	0	0-5	95-100	84-95	77-95	68-85	32-44	15-21
	41-44	Sandy loam, loam	SC, SC-SM	A-2-4, A-4	0	1-4	85-95	71-91	52-71	25-36	21-27	6-9
	44-62	Loam, clay loam	CL, SC	A-6	0	1-4	90-95	75-91	65-85	48-65	29-39	13-19
	62-66	Loam, clay loam	CL, SC	A-6	0	1-4	90-95	75-91	65-85	48-65	29-39	13-19
Floyd-----------	0-8	Loam, clay loam	ML	A-7-6, A-6, A-7-5	0	0	100	100	87-95	64-72	40-50	13-19
	8-24	Loam, clay loam	ML, CL	A-7-6, A-6	0	0	100	100	87-95	64-72	34-48	13-19
	24-33	Sandy clay loam, loam	SC	A-6, A-2-6	0	1-5	89-95	73-90	60-80	32-45	29-38	12-16
	33-41	Sandy loam, loam, sandy clay loam	SC, SM	A-2-4, A-1-b, A-6	0	1-5	88-94	71-89	48-77	22-44	18-36	3-16
	41-50	Loam, clay loam	CL, SC	A-6, A-7-6	0	1-5	89-95	73-90	61-86	45-66	27-42	12-21
	50-80	Loam, clay loam	CL, SC	A-6, A-7-6	0	1-4	90-96	75-91	63-87	46-67	27-41	12-21
394B:												
Ostrander-------	0-8	Loam, silt loam	CL, ML	A-6, A-7-6	0	0	100	95-100	85-99	68-81	34-45	11-18
	8-19	Loam, silt loam	CL, ML	A-6, A-7-6	0	0	100	95-100	83-97	67-80	34-45	11-18
	19-31	Loam, silt loam	CL	A-6, A-7-6	0	0	95-100	90-100	77-94	56-71	29-41	12-19
	31-45	Loam, clay loam	CL	A-6, A-7-6	0	1-4	96-100	87-100	71-94	51-71	27-41	12-21
	45-79	Loam, clay loam	CL	A-6, A-7-6	0	1-4	96-100	87-100	71-94	51-71	27-41	12-21
394C:												
Ostrander-------	0-8	Loam, silt loam	CL, ML	A-6, A-7-6	0	0	100	95-100	85-99	68-81	34-45	11-18
	8-19	Loam, silt loam	CL, ML	A-6, A-7-6	0	0	100	95-100	83-97	67-80	34-45	11-18
	19-31	Loam, silt loam	CL	A-6, A-7-6	0	0	95-100	90-100	77-94	56-71	29-41	12-19
	31-45	Loam, clay loam	CL	A-6, A-7-6	0	1-4	96-100	87-100	71-94	51-71	27-41	12-21
	45-79	Loam, clay loam	CL	A-6, A-7-6	0	1-4	96-100	87-100	71-94	51-71	27-41	12-21
395B:												
Marquis---------	0-8	Loam	CL	A-6, A-7-6	0	0	100	95-100	80-93	58-70	34-44	11-18
	8-19	Loam	CL	A-6, A-7-6	0	0	100	95-100	80-93	58-70	34-44	11-18
	19-24	Loam	CL, SC	A-6, A-7-6	0	0-5	89-95	78-90	66-86	49-65	31-44	13-21
	24-54	Loam	CL	A-6	0	0-4	90-95	79-91	69-83	50-62	29-36	13-16
	54-80	Loam	CL	A-6	0	0-4	90-95	79-91	69-83	50-62	29-35	13-16

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
398:												
Tripoli---------	0-8	Clay loam, silty clay loam	MH	A-7-5	0	0	100	100	89-93	70-74	50-56	19-22
	8-18	Clay loam, silty clay loam	MH, CL, ML	A-7-6, A-7-5	0	0	100	100	89-93	70-74	46-54	19-22
	18-24	Clay loam	CL	A-6, A-7-6	0	1-4	89-95	78-90	67-83	51-64	32-42	15-19
	24-38	Loam	CL	A-6	0	1-4	89-95	78-90	68-84	50-64	31-40	15-19
	38-66	Loam, clay loam	CL	A-6	0	1-4	90-95	79-91	68-85	50-65	29-39	13-19
399:												
Readlyn---------	0-8	Loam, clay loam	ML	A-7-6, A-6, A-7-5	0	0	100	100	85-95	62-72	37-49	11-19
	8-19	Loam, clay loam	ML, CL	A-7-6, A-6	0	0	100	100	85-95	62-72	34-47	11-19
	19-24	Loam	CL	A-6, A-7-6	0	1-4	89-95	78-90	68-84	50-64	34-44	15-19
	24-46	Clay loam, loam	CL	A-6, A-7-6	0	1-4	89-95	78-90	67-83	51-64	32-42	15-19
	46-79	Loam	CL, SC	A-6	0	1-4	90-96	80-91	68-84	49-62	27-35	12-16
408B:												
Olin------------	0-8	Fine sandy loam, sandy loam	SC, SC-SM	A-4, A-6	0	0	100	95-100	85-96	39-47	25-33	7-11
	8-19	Fine sandy loam, sandy loam	SC, SC-SM	A-4, A-6	0	0	100	95-100	85-96	38-46	24-32	7-12
	19-31	Sandy loam	SC, SC-SM	A-4, A-2-4, A-6	0	0	100	95-100	70-80	35-43	22-29	7-12
	31-53	Loam, clay loam, sandy clay loam	CL	A-6	0	1-4	89-95	78-90	67-85	50-65	29-39	13-19
	53-80	Loam, clay loam	CL	A-6	0	1-4	90-95	79-91	68-85	50-65	29-39	13-19
471:												
Oran------------	0-8	Loam, silt loam	CL, ML	A-6, A-4, A-7-6	0	0	100	100	85-93	61-69	32-42	10-16
	8-13	Loam, silt loam	CL, SC	A-6, A-4	0	1-5	90-95	79-95	67-88	48-65	26-36	10-16
	13-18	Loam, silt loam	CL	A-6, A-4	0	0	100	100	85-93	61-69	26-36	10-16
	18-45	Clay loam, loam, sandy clay loam	CL, SC	A-6, A-7-6	0	1-4	89-95	74-90	62-83	45-63	31-41	15-21
	45-80	Loam	CL, SC	A-6	0	1-4	89-95	74-90	64-84	47-63	29-37	13-18
485:												
Spillville, occasionally flooded--------	0-8	Loam	ML	A-7-6, A-6	0	0	100	95-100	81-93	58-70	36-46	11-18
	8-54	Loam	CL	A-6, A-7-6	0	0	100	95-100	81-93	58-70	29-44	12-18
	54-79	Loam, sandy loam, sandy clay loam	CL	A-6, A-4	0	0	100	95-100	79-93	56-69	26-38	9-16

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
582B:												
Kasson----------	0-8	Loam, silt loam	CL	A-6, A-7-6	0	0	100	95-100	81-92	58-69	33-42	11-17
	8-11	Silt loam, loam	CL	A-6	0	0	100	95-100	85-96	69-80	28-37	12-17
	11-20	Loam, clay loam, sandy clay loam	CL, SC	A-6	0	1-4	90-95	75-91	65-85	48-65	29-39	13-19
	20-41	Loam, clay loam, sandy clay loam	CL, SC	A-6	0	1-4	90-95	75-91	65-85	48-65	29-39	13-19
	41-53	Loam	CL, SC	A-6	0	1-4	86-96	77-92	66-86	49-65	29-39	13-19
	53-69	Loam	CL, SC	A-6	0	1-4	90-96	77-92	67-83	49-62	29-35	13-16
	69-80	Loam	CL, SC	A-6	0	1-4	90-96	77-92	67-83	49-62	29-35	13-16
582C:												
Kasson----------	0-8	Loam, silt loam	CL	A-6, A-7-6	0	0	100	95-100	81-92	58-69	33-42	11-17
	8-11	Silt loam, loam	CL	A-6	0	0	100	95-100	85-96	69-80	28-37	12-17
	11-20	Loam, clay loam, sandy clay loam	CL, SC	A-6	0	1-4	90-95	75-91	65-85	48-65	29-39	13-19
	20-41	Loam, clay loam, sandy clay loam	CL, SC	A-6	0	1-4	90-95	75-91	65-85	48-65	29-39	13-19
	41-53	Loam	CL, SC	A-6	0	1-4	86-96	77-92	66-86	49-65	29-39	13-19
	53-69	Loam	CL, SC	A-6	0	1-4	90-96	77-92	67-83	49-62	29-35	13-16
	69-80	Loam	CL, SC	A-6	0	1-4	90-96	77-92	67-83	49-62	29-35	13-16
585:												
Spillville, occasionally flooded--------	0-8	Loam	ML	A-7-6, A-6	0	0	100	95-100	81-93	58-70	36-46	11-18
	8-54	Loam	CL	A-6, A-7-6	0	0	100	95-100	81-93	58-70	29-44	12-18
	54-80	Loam, sandy loam, sandy clay loam	CL	A-6, A-4	0	0	100	95-100	79-93	56-69	26-38	9-16
Coland, occasionally flooded--------	0-8	Clay loam, silty clay loam	MH, ML	A-7-5, A-7-6	0	0	100	100	90-98	78-86	47-59	18-24
	8-32	Silty clay loam, clay loam	MH, CL, ML	A-7-6, A-7-5	0	0	100	100	95-100	84-92	43-57	18-24
	32-40	Clay loam, loam	CL, CH	A-7-6, A-6	0	0	100	100	88-98	72-82	39-53	17-25
	40-44	Sandy loam, clay loam, loam	SC, SC-SM	A-6, A-2-4, A-7-6	0	0	100	89-100	62-86	29-48	22-42	7-19
	44-52	Loam, clay loam, sandy loam	CL, CL-ML	A-6, A-4, A-7-6	0	0	100	89-100	72-97	51-73	22-42	7-19
	52-60	Sandy loam, clay loam, loam	SC, SC-SM	A-6, A-2-4	0	0	100	89-100	62-86	29-48	22-40	7-19

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
620B:												
Port Byron------	0-8	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	94-100	86-96	27-38	6-13
	8-13	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	22-34	6-13
	13-31	Silt loam, silty clay loam	CL	A-6, A-4, A-7-6	0	0	100	100	90-100	86-100	24-42	9-21
	31-52	Silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	90-100	83-98	22-39	7-19
	52-59	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	18-28	4-12
	59-80	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	18-28	4-12
620C2:												
Port Byron------	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	22-36	6-13
	8-31	Silt loam, silty clay loam	CL	A-6, A-4, A-7-6	0	0	100	100	90-100	86-100	24-42	9-21
	31-52	Silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	90-100	83-98	22-39	7-19
	52-59	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	18-28	4-12
	59-80	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	18-28	4-12
626:												
Hayfield, rarely flooded--------	0-8	Loam, silt loam	CL, ML	A-7-6, A-6	0	0	100	100	85-94	68-77	34-45	11-18
	8-13	Loam, silt loam	CL	A-6	0	0	100	100	85-94	68-77	28-39	12-19
	13-29	Loam, clay loam, sandy clay loam	CL	A-6, A-7-6	0	0	95-100	83-100	70-96	51-74	27-42	12-21
	29-80	Coarse sand, sand, loamy coarse sand, loamy sand	SW-SM, SM	A-1-b	0	0-3	85-100	66-95	29-47	7-14	0-17	NP-2
663B:												
Seaton----------	0-8	Silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	94-100	86-96	24-36	7-15
	8-15	Silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	94-100	86-96	23-34	7-15
	15-44	Silt loam	CL	A-6, A-4	0	0	100	100	92-100	85-98	24-38	9-19
	44-70	Silt loam, silt	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	20-30	6-13
	70-80	Silt loam, silt	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	20-30	6-13
663C:												
Seaton----------	0-8	Silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	94-100	86-96	24-36	7-15
	8-15	Silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	94-100	86-96	23-34	7-15
	15-44	Silt loam	CL	A-6, A-4	0	0	100	100	92-100	85-98	24-38	9-19
	44-70	Silt loam, silt	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	20-30	6-13
	70-80	Silt loam, silt	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	20-30	6-13

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
663D2:												
Seaton, moderately eroded---------	0-8	Silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	94-100	86-96	24-36	7-15
	8-44	Silt loam	CL	A-6, A-4	0	0	100	100	92-100	85-98	24-38	9-19
	44-70	Silt loam, silt	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	20-30	6-13
	70-80	Silt loam, silt	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	20-30	6-13
663D3:												
Seaton, severely eroded---------	0-8	Silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	92-100	84-94	22-34	7-15
	8-44	Silt loam	CL	A-6, A-4	0	0	100	100	92-100	85-98	24-38	9-19
	44-70	Silt loam, silt	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	20-30	6-13
	70-95	Silt loam, silt	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	20-30	6-13
663E2:												
Seaton, moderately eroded---------	0-8	Silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	94-100	86-96	24-36	7-15
	8-44	Silt loam	CL	A-6, A-4	0	0	100	100	92-100	85-98	24-38	9-19
	44-70	Silt loam, silt	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	20-30	6-13
	70-80	Silt loam, silt	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	20-30	6-13
663G:												
Seaton----------	0-4	Silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	94-100	86-96	24-36	7-15
	4-9	Silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	94-100	86-96	23-34	7-15
	9-44	Silt loam	CL	A-6, A-4	0	0	100	100	92-100	85-98	24-38	9-19
	44-70	Silt loam, silt	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	20-30	6-13
	70-80	Silt loam, silt	CL, CL-ML	A-4, A-6	0	0	100	100	94-100	86-96	20-30	6-13
775:												
Billett---------	0-8	Sandy loam, fine sandy loam	SC-SM, SM, SC	A-4, A-2-4	0	0	100	95-100	69-82	33-45	18-29	2-9
	8-13	Sandy loam, fine sandy loam	SC, SC-SM	A-4, A-2-4, A-6	0	0	100	95-100	69-81	33-43	21-29	6-12
	13-28	Sandy loam, fine sandy loam, loam	SC, SC-SM	A-4, A-2-4, A-6	0	0	100	95-100	69-81	33-43	20-28	6-12
	28-41	Loamy sand, sandy loam	SC, SC-SM	A-2-4, A-2-6	0	0	96-100	81-100	62-86	13-27	18-28	4-12
	41-47	Sandy loam, loamy sand	SC, SC-SM	A-2-4, A-6	0	0	96-100	81-100	58-82	27-44	18-28	4-12
	47-52	Loamy sand, loamy fine sand, fine sand, sand	SM	A-2-4	0	0-4	86-100	68-100	52-82	18-32	0-19	NP-3
	52-60	Gravelly loamy sand, gravelly sand, loamy sand, sand	SM	A-2-4, A-1-b	0	0-4	86-100	64-100	49-82	17-32	0-19	NP-3

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
775B:												
Billett---------	0-8	Sandy loam, fine sandy loam	SC-SM, SM, SC	A-4, A-2-4	0	0	100	95-100	69-82	33-45	18-29	2-9
	8-13	Sandy loam, fine sandy loam	SC, SC-SM	A-4, A-2-4, A-6	0	0	100	95-100	69-81	33-43	21-29	6-12
	13-28	Sandy loam, fine sandy loam, loam	SC, SC-SM	A-4, A-2-4, A-6	0	0	100	95-100	69-81	33-43	20-28	6-12
	28-41	Loamy sand, sandy loam	SC, SC-SM	A-2-4, A-2-6	0	0	96-100	81-100	62-86	13-27	18-28	4-12
	41-47	Sandy loam, loamy sand	SC, SC-SM	A-2-4, A-6	0	0	96-100	81-100	58-82	27-44	18-28	4-12
	47-52	Loamy sand, loamy fine sand, sand, fine sand	SM	A-2-4	0	0-4	86-100	68-100	52-82	18-32	0-19	NP-3
	52-60	Gravelly loamy sand, loamy sand, gravelly sand, sand	SM	A-2-4, A-1-b	0	0-4	86-100	64-100	49-82	17-32	0-19	NP-3
775C:												
Billett---------	0-8	Sandy loam, fine sandy loam	SC-SM, SM, SC	A-4, A-2-4	0	0	100	95-100	69-82	33-45	18-29	2-9
	8-13	Sandy loam, fine sandy loam	SC, SC-SM	A-4, A-2-4, A-6	0	0	100	95-100	69-81	33-43	21-29	6-12
	13-28	Sandy loam, fine sandy loam, loam	SC, SC-SM	A-4, A-2-4, A-6	0	0	100	95-100	69-81	33-43	20-28	6-12
	28-41	Loamy sand, sandy loam	SC, SC-SM	A-2-4, A-2-6	0	0	96-100	81-100	62-86	13-27	18-28	4-12
	41-47	Sandy loam, loamy sand	SC, SC-SM	A-2-4, A-6	0	0	96-100	81-100	58-82	27-44	18-28	4-12
	47-52	Loamy sand, loamy fine sand, fine sand, sand	SM	A-2-4	0	0-4	86-100	68-100	52-82	18-32	0-19	NP-3
	52-60	Gravelly loamy sand, gravelly sand, loamy sand, sand	SM	A-2-4, A-1-b	0	0-4	86-100	64-100	49-82	17-32	0-19	NP-3
778:												
Sattre, rarely flooded--------	0-8	Loam	CL	A-6	0	0	100	89-100	77-92	55-68	32-40	12-16
	8-13	Loam	CL	A-6	0	0	100	89-100	77-92	55-68	29-38	12-16
	13-17	Loam, clay loam	CL, SC	A-6	0	0-5	87-100	69-100	59-95	43-72	28-40	12-19
	17-32	Loam, sandy clay loam, clay loam	CL, SC	A-6	0	0-5	87-100	69-100	59-95	43-72	28-40	12-19
	32-35	Sandy loam, loam, sandy clay loam, clay loam	SC, CL	A-6, A-2-6	0	0-5	87-100	69-100	54-88	34-59	28-40	12-19
	35-60	Sand, gravelly coarse sand, gravelly sand	SM, SP-SM, SC-SM	A-2-4, A-1-b	0	1-9	84-92	53-92	35-66	8-20	0-20	NP-4

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
813B:												
Atkinson--------	0-8	Loam	CL, ML	A-6, A-7-6	0	0	100	95-100	81-92	59-68	34-42	11-16
	8-13	Loam	CL, ML	A-6, A-7-6	0	0	100	95-100	81-92	59-68	32-42	12-16
	13-24	Loam, clay loam, sandy clay loam	CL	A-6, A-7-6	0	1-4	91-95	78-95	69-91	52-71	36-46	16-22
	24-45	Clay loam, loam, sandy clay loam	CL, SC	A-7-6, A-6	0	1-4	91-95	78-95	62-90	46-70	31-49	13-25
	45-50	Clay	CH	A-7-6	0	1-9	87-97	74-97	67-96	54-80	50-62	29-37
	50-80	Bedrock	---	---	---	---	---	---	---	---	---	---
813C:												
Atkinson--------	0-8	Loam	CL, ML	A-6, A-7-6	0	0	100	95-100	81-92	59-68	34-42	11-16
	8-13	Loam	CL, ML	A-6, A-7-6	0	0	100	95-100	81-92	59-68	32-42	12-16
	13-24	Loam, clay loam, sandy clay loam	CL	A-6, A-7-6	0	1-4	91-95	78-95	69-91	52-71	36-46	16-22
	24-45	Clay loam, loam, sandy clay loam	CL, SC	A-7-6, A-6	0	1-4	91-95	78-95	62-90	46-70	31-49	13-25
	45-50	Clay	CH	A-7-6	0	1-9	87-97	74-97	67-96	54-80	50-62	29-37
	50-80	Bedrock	---	---	---	---	---	---	---	---	---	---
814B:												
Rockton---------	0-8	Loam	CL, SC, ML	A-6, A-7-6	0	0	89-100	79-100	67-94	49-71	34-45	11-18
	8-15	Loam	CL, SC, ML	A-6, A-7-6	0	0	89-100	79-100	67-94	49-71	34-45	11-18
	15-26	Loam, clay loam, sandy clay loam	CL	A-6, A-7-6	0	0	90-100	80-100	72-99	54-77	36-47	17-25
	26-31	Clay, silty clay, clay loam	CH, CL	A-7-6	0	0-1	90-100	79-100	69-100	55-94	45-72	25-45
	31-80	Bedrock	---	---	---	---	---	---	---	---	---	---
814C:												
Rockton---------	0-8	Loam	CL, SC, ML	A-6, A-7-6	0	0	89-100	79-100	67-94	49-71	34-45	11-18
	8-15	Loam	CL, SC, ML	A-6, A-7-6	0	0	89-100	79-100	67-94	49-71	34-45	11-18
	15-26	Loam, clay loam, sandy clay loam	CL	A-6, A-7-6	0	0	90-100	80-100	72-99	54-77	36-47	17-25
	26-31	Clay, silty clay, clay loam	CH, CL	A-7-6	0	0-1	90-100	79-100	69-100	55-94	45-72	25-45
	31-80	Bedrock	---	---	---	---	---	---	---	---	---	---
814D:												
Rockton---------	0-8	Loam	CL, SC, ML	A-6, A-7-6	0	0	89-100	79-100	67-94	49-71	34-45	11-18
	8-15	Loam	CL, SC, ML	A-6, A-7-6	0	0	89-100	79-100	67-94	49-71	34-45	11-18
	15-26	Loam, clay loam, sandy clay loam	CL	A-6, A-7-6	0	0	90-100	80-100	72-99	54-77	36-47	17-25
	26-31	Clay, silty clay, clay loam	CH, CL	A-7-6	0	0-1	90-100	79-100	69-100	55-94	45-72	25-45
	31-80	Bedrock	---	---	---	---	---	---	---	---	---	---

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
884:												
Klingmore-------	0-8	Silty clay loam, silt loam	ML, MH	A-7-5, A-7-6	0	0	100	100	97-100	93-97	46-52	18-21
	8-19	Silty clay loam, silt loam	ML, CL	A-7-6	0	0	100	100	97-100	93-97	44-50	18-21
	19-56	Silty clay loam, silt loam	CL	A-7-6, A-6	0	0	100	100	94-100	90-99	37-47	18-25
	56-80	Loam, clay loam	CL	A-6	0	0-4	90-95	75-91	72-91	58-77	29-39	13-19
930:												
Orion, occasionally flooded--------	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	93-100	85-95	21-34	4-11
	8-32	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	93-100	85-95	21-34	4-11
	32-39	Silt loam, silty clay loam	ML, CL-ML, MH	A-7-6, A-4, A-7-5	0	0	100	100	87-100	80-100	25-57	4-20
	39-60	Stratified silt loam to very fine sand	CL, CL-ML	A-4, A-6	0	0	82-100	74-100	70-100	65-100	18-28	4-12
982:												
Maxmore---------	0-8	Silty clay loam, silt loam	MH, ML	A-7-5	0	0	100	100	93-100	89-99	47-62	17-24
	8-20	Silty clay loam, silt loam	MH, CL	A-7-5, A-7-6	0	0	100	100	93-100	89-99	41-57	17-24
	20-50	Silty clay loam, silt loam	CL	A-7-6, A-6	0	0	100	100	93-100	89-99	36-49	17-25
	50-80	Loam, clay loam	CL	A-6	0	0-4	90-95	75-91	72-91	58-77	29-39	13-19
1152:												
Marshan, rarely flooded--------	0-8	Clay loam, loam, silty clay loam	MH, ML	A-7-5, A-7-6	0	0	94-100	89-100	80-100	69-88	45-57	17-24
	8-14	Silty clay loam, loam, clay loam	CL, MH	A-7-6, A-6	0	0	94-100	89-100	84-100	74-93	39-55	17-25
	14-18	Silty clay loam, loam, clay loam	CL, CH	A-7-6, A-6	0	0	95-100	90-100	84-100	75-93	37-51	17-25
	18-23	Silty clay loam, loam, clay loam	CL	A-7-6, A-6	0	0	95-100	90-100	84-100	75-93	36-47	17-25
	23-30	Loam, clay loam, sandy loam	CL, SC	A-6, A-7-6	0	0	95-100	71-100	59-96	43-74	28-42	12-21
	30-40	Sand, gravelly sand	SP-SM, SP	A-3, A-2-4	0	0-3	90-95	70-90	53-72	4-10	0-17	NP-2
	40-60	Gravelly sand, sand	SP-SM, SP	A-1-b, A-1-a, A-2-4	0	0-3	73-95	25-90	19-72	2-10	0-17	NP-2

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
1226:												
Lawler, rarely flooded--------	0-8	Loam, silt loam	ML	A-7-6, A-6	0	0	100	88-100	75-94	55-72	36-47	11-18
	8-19	Loam, silt loam	CL, ML	A-6, A-7-6	0	0	100	88-100	75-94	55-72	33-45	11-18
	19-38	Loam, sandy clay loam	CL, SC	A-6, A-7-6	0	0-5	89-95	73-90	63-85	46-64	30-42	13-19
	38-80	Gravelly sand, sand	SP-SM, SP	A-1-b, A-1-a, A-2-4	0	0-3	73-95	25-90	19-72	2-10	0-17	NP-2
1585:												
Spillville, channeled------	0-54	Loam	ML	A-7-6, A-6	0	0	100	95-100	81-93	58-70	36-46	11-18
	54-80	Loam, sandy loam, sandy clay loam	CL	A-6, A-4	0	0	100	95-100	79-93	56-69	26-38	9-16
Coland, channeled------	0-32	Clay loam, silty clay loam	MH, ML	A-7-5, A-7-6	0	0	100	100	90-98	78-86	47-59	18-24
	32-40	Clay loam, loam	CL, CH	A-7-6, A-6	0	0	100	100	88-98	72-82	39-53	17-25
	40-44	Sandy loam, clay loam, loam	SC, SC-SM	A-6, A-2-4, A-7-6	0	0	100	89-100	62-86	29-48	22-42	7-19
	44-52	Loam, clay loam, sandy loam	CL, CL-ML	A-6, A-4, A-7-6	0	0	100	89-100	72-97	51-73	22-42	7-19
	52-60	Sandy loam, clay loam, loam	SC, SC-SM	A-6, A-4	0	0	100	89-100	62-86	29-48	22-40	7-19
Aquolls, ponded.												
1586:												
Sigglekov, frequently flooded--------	0-9	Loam, sandy loam, silt loam	CL-ML, CL	A-4	0	0	100	100	85-90	59-64	21-28	6-9
	9-15	Sandy loam, loamy sand, sand	SM, SC-SM	A-4, A-2-4	0	0	90-100	79-95	59-78	31-44	0-21	NP-6
	15-35	Sand, loamy sand, sandy loam	SP-SM, SC-SM	A-2-4, A-3	0	0	90-100	79-95	60-80	7-16	0-21	NP-6
	35-80	Coarse sand, loamy sand, sandy loam	SP-SM, SC-SM	A-1-b, A-2-4	0	0	90-100	79-95	36-51	7-16	0-21	NP-6
Fluvaquents, frequently flooded.												
Aquents, ponded.												

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
4946. Udorthents-Interstate highway												
5010. Pits, sand and gravel												
5030. Pits, limestone quarries												
5040. Udorthents, loamy												
5080. Udorthents, sanitary landfill												
8041: Sparta, terrace, rarely flooded	0-8	Loamy sand, loamy fine sand, fine sand, sand	SM, SC-SM	A-2-4	0	0	86-100	72-100	53-81	14-27	0-25	NP-6
	8-15	Loamy fine sand, loamy sand, fine sand, sand	SM, SC-SM	A-2-4	0	0	86-100	72-100	66-98	18-33	0-22	NP-6
	15-72	Fine sand, loamy fine sand, loamy sand, sand	SP-SM, SC-SM	A-2-4, A-3	0	0	87-100	75-100	68-98	7-17	0-20	NP-4
	72-80	Loamy fine sand, fine sand, sand	SP-SM, SC-SM	A-3, A-2-4	0	0	88-100	76-100	70-100	7-18	0-20	NP-5
8041B: Sparta, terrace, rarely flooded	0-8	Loamy sand, loamy fine sand, fine sand, sand	SM, SC-SM	A-2-4	0	0	86-100	72-100	53-81	14-27	0-25	NP-6
	8-15	Loamy fine sand, loamy sand, fine sand, sand	SM, SC-SM	A-2-4	0	0	86-100	72-100	66-98	18-33	0-22	NP-6
	15-72	Fine sand, sand, loamy fine sand, loamy sand	SP-SM, SC-SM	A-2-4, A-3	0	0	87-100	75-100	68-98	7-17	0-20	NP-4
	72-80	Loamy fine sand, fine sand, sand	SP-SM, SC-SM	A-3, A-2-4	0	0	88-100	76-100	70-100	7-18	0-20	NP-5

Engineering Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
8175B: Dickinson, terrace, rarely flooded--------	0-8	Fine sandy loam, sandy loam, loam	SC, SC-SM	A-4, A-6	0	0	100	100	90-96	41-47	25-33	7-11
	8-18	Fine sandy loam, sandy loam, loam	SC, SC-SM	A-4, A-6	0	0	100	100	89-97	39-47	21-33	6-11
	18-30	Fine sandy loam, sandy loam	SC, SC-SM	A-4, A-6	0	0	100	100	89-97	39-47	20-28	6-12
	30-36	Loamy sand, loamy fine sand, fine sand, sand	SM, SC-SM	A-2-4	0	0	100	100	78-83	21-26	16-21	2-6
	36-60	Sand, fine sand, loamy sand, loamy fine sand	SM, SP-SM, SC-SM	A-2-4	0	0	100	100	78-83	12-17	16-21	2-6
AW. Animal waste lagoon												
SL. Sewage lagoon												
W. Water												

Physical Properties

The table described in this section shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$- or $^1/_{10}$-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity refers to the ability of a soil to transmit water or air. The term “permeability,” as used in soil surveys, indicates saturated hydraulic conductivity (Ksat). The estimates in the table indicate the rate of water movement, in micrometers per second, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook," which is available in local offices of the Natural Resources Conservation Service or on the Internet.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Physical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer. Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
41B:													
Sparta---------------	80	0-8	3-10	1.20-1.40	10.00-705.00	0.09-0.12	0.0-0.0	1.0-2.0	.17	.17	5	2	134
		8-15	3-10	1.20-1.40	10.00-705.00	0.09-0.12	0.0-0.0	0.5-1.0	.17	.17			
		15-72	1-8	1.40-1.60	10.00-705.00	0.05-0.11	0.0-0.0	0.0-0.5	.15	.15			
		72-80	0-9	1.50-1.70	10.00-705.00	0.04-0.07	0.0-0.0	0.0-0.5	.15	.15			
41C:													
Sparta---------------	80	0-8	3-10	1.20-1.40	10.00-705.00	0.09-0.12	0.0-0.0	1.0-2.0	.17	.17	5	2	134
		8-15	3-10	1.20-1.40	10.00-705.00	0.09-0.12	0.0-0.0	0.5-1.0	.17	.17			
		15-72	1-8	1.40-1.60	10.00-705.00	0.05-0.11	0.0-0.0	0.0-0.5	.15	.15			
		72-80	0-9	1.50-1.70	10.00-705.00	0.04-0.07	0.0-0.0	0.0-0.5	.15	.15			
43:													
Bremer---------------	100	0-8	27-36	1.25-1.30	1.00-10.00	0.21-0.23	3.2-6.1	5.0-7.0	.32	.32	5	7	38
		8-19	27-36	1.25-1.30	1.00-10.00	0.21-0.23	3.2-6.1	4.0-6.0	.32	.32			
		19-42	35-42	1.30-1.40	1.00-10.00	0.15-0.17	5.8-8.0	1.0-2.0	.43	.43			
		42-60	32-38	1.40-1.45	1.00-10.00	0.18-0.20	4.8-6.7	0.5-1.0	.43	.43			
50B:													
Coloma---------------	85	0-8	0-10	1.35-1.65	10.00-705.00	0.07-0.12	0.0-0.0	1.0-2.0	.15	.15	5	1	250
		8-39	0-14	1.50-1.65	10.00-705.00	0.05-0.10	0.0-0.0	0.0-1.0	.15	.15			
		39-80	0-14	1.50-1.65	10.00-705.00	0.05-0.10	0.0-0.0	0.0-0.5	.15	.15			
63B:													
Chelsea--------------	90	0-8	8-15	1.50-1.55	10.00-705.00	0.10-0.15	0.0-0.0	0.5-1.5	.17	.17	5	2	134
		8-15	5-10	1.55-1.70	10.00-705.00	0.06-0.08	0.0-0.0	0.0-0.5	.17	.17			
		15-36	5-10	1.55-1.70	10.00-705.00	0.06-0.08	0.0-0.0	0.0-0.5	.17	.17			
		36-70	5-10	1.55-1.70	10.00-705.00	0.06-0.08	0.0-0.0	0.0-0.5	.17	.17			
63C:													
Chelsea--------------	85	0-8	8-15	1.50-1.55	10.00-705.00	0.10-0.15	0.0-0.0	0.5-1.5	.17	.17	5	2	134
		8-15	5-10	1.55-1.70	10.00-705.00	0.06-0.08	0.0-0.0	0.0-0.5	.17	.17			
		15-36	5-10	1.55-1.70	10.00-705.00	0.06-0.08	0.0-0.0	0.0-0.5	.17	.17			
		36-70	5-10	1.55-1.70	10.00-705.00	0.06-0.08	0.0-0.0	0.0-0.5	.17	.17			
63E:													
Chelsea--------------	85	0-8	8-15	1.50-1.55	10.00-705.00	0.10-0.15	0.0-0.0	0.5-1.5	.17	.17	5	2	134
		8-15	5-10	1.55-1.70	10.00-705.00	0.06-0.08	0.0-0.0	0.0-0.5	.17	.17			
		15-36	5-10	1.55-1.70	10.00-705.00	0.06-0.08	0.0-0.0	0.0-0.5	.17	.17			
		36-70	5-10	1.55-1.70	10.00-705.00	0.06-0.08	0.0-0.0	0.0-0.5	.17	.17			

Physical Properties of the Soils--Continued

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi- bility group	Wind erodi- bility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
83B:													
Kenyon---------------	75	0-8	18-26	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.9	3.0-4.0	.24	.24	5	6	48
		8-14	18-26	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.9	2.0-3.0	.24	.24			
		14-19	18-26	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.9	1.0-3.0	.24	.24			
		19-55	20-30	1.75-1.90	0.01-1.00	0.17-0.19	1.0-4.2	0.0-1.0	.28	.28			
		55-79	20-24	1.75-1.90	0.01-1.00	0.17-0.19	1.0-2.3	0.0-0.5	.37	.37			
83C:													
Kenyon---------------	75	0-8	18-26	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.9	3.0-4.0	.24	.24	5	6	48
		8-14	18-26	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.9	2.0-3.0	.24	.24			
		14-19	18-26	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.9	1.0-3.0	.24	.24			
		19-55	20-30	1.75-1.90	0.01-1.00	0.17-0.19	1.0-4.2	0.0-1.0	.28	.28			
		55-79	20-24	1.75-1.90	0.01-1.00	0.17-0.19	1.0-2.3	0.0-0.5	.37	.37			
84:													
Clyde----------------	80	0-8	25-32	1.35-1.40	1.00-10.00	0.21-0.23	2.6-4.8	6.0-9.0	.28	.28	5	7	38
		8-17	28-32	1.35-1.40	1.00-10.00	0.21-0.23	3.5-4.8	2.0-6.0	.28	.28			
		17-23	28-32	1.35-1.40	1.00-10.00	0.21-0.23	3.5-4.8	1.0-4.0	.28	.28			
		23-28	22-30	1.45-1.65	1.00-10.00	0.18-0.20	1.6-4.2	0.5-2.0	.37	.37			
		28-41	22-30	1.45-1.65	1.00-10.00	0.18-0.20	1.6-4.2	0.5-2.0	.37	.37			
		41-44	10-15	1.60-1.70	1.00-10.00	0.11-0.13	0.0-0.0	0.5-1.0	.37	.37			
		44-62	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.37	.37			
		62-66	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.37	.37			
109B:													
Backbone-------------	100	0-8	8-18	1.50-1.55	10.00-100.00	0.12-0.14	0.0-0.4	1.0-2.0	.20	.20	3	3	86
		8-24	12-18	1.55-1.65	10.00-100.00	0.11-0.13	0.0-0.4	0.5-1.0	.20	.20			
		24-30	20-40	1.50-1.60	1.00-10.00	0.12-0.15	1.0-7.3	0.0-0.5	.37	.37			
		30-80	---	---	0.01-10.00	---	---	---	---	---			
109C:													
Backbone-------------	100	0-8	8-18	1.50-1.55	10.00-100.00	0.12-0.14	0.0-0.4	1.0-2.0	.20	.20	3	3	86
		8-24	12-18	1.55-1.65	10.00-100.00	0.11-0.13	0.0-0.4	0.5-1.0	.20	.20			
		24-30	20-40	1.50-1.60	1.00-10.00	0.12-0.15	1.0-7.3	0.0-0.5	.37	.37			
		30-80	---	---	0.01-10.00	---	---	---	---	---			
109D:													
Backbone-------------	100	0-8	8-18	1.50-1.55	10.00-100.00	0.12-0.14	0.0-0.4	1.0-2.0	.20	.20	3	3	86
		8-24	12-18	1.55-1.65	10.00-100.00	0.11-0.13	0.0-0.4	0.5-1.0	.20	.20			
		24-30	20-40	1.50-1.60	1.00-10.00	0.12-0.15	1.0-7.3	0.0-0.5	.37	.37			
		30-80	---	---	0.01-10.00	---	---	---	---	---			

Physical Properties of the Soils--Continued

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
127:													
Plano, rarely flooded	85	0-8	20-35	1.30-1.35	1.00-10.00	0.21-0.23	1.0-5.8	3.5-4.5	.28	.28	5	6	48
		8-14	20-35	1.30-1.35	1.00-10.00	0.21-0.23	1.0-5.8	1.0-3.0	.28	.28			
		14-43	20-35	1.30-1.40	1.00-10.00	0.18-0.20	1.0-5.8	0.5-1.0	.43	.43			
		43-49	25-30	1.40-1.55	1.00-10.00	0.18-0.20	2.6-4.2	0.0-0.5	.37	.37			
		49-53	15-32	1.30-1.55	1.00-100.00	0.09-0.16	0.0-4.8	0.0-0.5	.37	.37			
		53-60	5-20	1.45-1.65	1.00-100.00	0.07-0.10	0.0-1.0	0.0-0.5	.15	.20			
		60-72	5-20	1.55-1.65	1.00-100.00	0.08-0.10	0.0-1.0	0.0-0.5	.20	.20			
135:													
Coland, occasionally flooded-------------	85	0-8	27-35	1.40-1.50	1.00-10.00	0.20-0.22	3.2-5.8	5.0-7.0	.24	.24	5	6	48
		8-32	27-35	1.40-1.50	1.00-10.00	0.20-0.22	3.2-5.8	3.0-6.0	.24	.24			
		32-40	25-35	1.40-1.50	1.00-10.00	0.20-0.22	2.6-5.8	2.0-4.0	.24	.24			
		40-44	12-28	1.50-1.65	1.00-10.00	0.13-0.17	0.0-3.5	0.0-2.0	.28	.28			
		44-52	12-28	1.50-1.65	1.00-10.00	0.13-0.17	0.0-3.5	0.0-2.0	.28	.28			
		52-60	12-28	1.50-1.65	1.00-10.00	0.13-0.17	0.0-3.5	0.0-1.0	.28	.28			
153:													
Shandep, ponded, occasionally flooded-------------	75	0-8	27-32	1.35-1.40	1.00-10.00	0.20-0.23	3.2-4.8	7.0-9.0	.24	.24	4	6	48
		8-29	27-32	1.35-1.40	1.00-10.00	0.20-0.23	3.2-4.8	7.0-9.0	.24	.24			
		29-37	26-32	1.40-1.60	1.00-10.00	0.17-0.20	2.9-4.8	1.0-3.0	.24	.24			
		37-45	8-12	1.60-1.70	1.00-10.00	0.12-0.14	0.0-0.0	0.0-0.5	.17	.24			
		45-60	2-8	1.60-1.70	10.00-100.00	0.02-0.04	0.0-0.0	0.0-0.5	.10	.15			
173:													
Hoopeston, rarely flooded-------------	100	0-8	8-18	1.35-1.70	10.00-100.00	0.12-0.15	0.0-0.4	2.0-3.0	.28	.28	4	5	56
		8-14	8-18	1.35-1.70	10.00-100.00	0.12-0.15	0.0-0.4	2.0-3.0	.28	.28			
		14-38	12-18	1.45-1.70	10.00-100.00	0.12-0.17	0.0-0.4	0.2-1.0	.28	.28			
		38-60	2-10	1.50-1.70	100.00-705.00	0.05-0.10	0.0-0.0	0.1-0.5	.17	.17			
175B:													
Dickinson------------	90	0-8	12-18	1.50-1.55	10.00-100.00	0.12-0.15	0.0-0.4	1.5-2.5	.20	.20	4	3	86
		8-18	10-18	1.45-1.55	10.00-100.00	0.12-0.15	0.0-0.4	0.5-2.5	.20	.20			
		18-30	10-18	1.45-1.55	10.00-100.00	0.12-0.15	0.0-0.4	0.0-0.5	.20	.20			
		30-36	5-10	1.55-1.65	10.00-705.00	0.08-0.10	0.0-0.0	0.0-0.5	.20	.20			
		36-60	5-10	1.60-1.70	10.00-705.00	0.02-0.04	0.0-0.0	0.0-0.5	.15	.15			

Physical Properties of the Soils--Continued

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodibility group	Wind erodibility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
175C:													
Dickinson------------	100	0-8	12-18	1.50-1.55	10.00-100.00	0.12-0.15	0.0-0.4	1.5-2.5	.20	.20	4	3	86
		8-18	10-18	1.45-1.55	10.00-100.00	0.12-0.15	0.0-0.4	0.5-2.5	.20	.20			
		18-30	10-18	1.45-1.55	10.00-100.00	0.12-0.15	0.0-0.4	0.0-0.5	.20	.20			
		30-36	5-10	1.55-1.65	10.00-705.00	0.08-0.10	0.0-0.0	0.0-0.5	.20	.20			
		36-60	5-10	1.60-1.70	10.00-705.00	0.02-0.04	0.0-0.0	0.0-0.5	.15	.15			
178:													
Waukee, rarely flooded-------------	85	0-8	18-24	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.3	3.0-4.0	.24	.24	4	6	48
		8-18	18-24	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.3	2.0-3.0	.24	.24			
		18-33	18-27	1.40-1.50	1.00-10.00	0.15-0.19	0.4-3.2	0.5-2.0	.28	.28			
		33-48	2-8	1.50-1.75	10.00-705.00	0.02-0.06	0.0-0.0	0.0-0.5	.10	.17			
		48-80	2-8	1.50-1.75	10.00-705.00	0.02-0.06	0.0-0.0	0.0-0.5	.10	.17			
178B:													
Waukee, rarely flooded-------------	95	0-8	18-24	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.3	3.0-4.0	.24	.24	4	6	48
		8-18	18-24	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.3	2.0-3.0	.24	.24			
		18-33	18-27	1.40-1.50	1.00-10.00	0.15-0.19	0.4-3.2	0.5-2.0	.28	.28			
		33-48	2-8	1.50-1.75	10.00-705.00	0.02-0.06	0.0-0.0	0.0-0.5	.10	.17			
		48-80	2-8	1.50-1.75	10.00-705.00	0.02-0.06	0.0-0.0	0.0-0.5	.10	.17			
178C:													
Waukee, rarely flooded-------------	95	0-8	18-24	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.3	3.0-4.0	.24	.24	4	6	48
		8-18	18-24	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.3	2.0-3.0	.24	.24			
		18-33	18-27	1.40-1.50	1.00-10.00	0.15-0.19	0.4-3.2	0.5-2.0	.28	.28			
		33-48	2-8	1.50-1.75	10.00-705.00	0.02-0.06	0.0-0.0	0.0-0.5	.10	.17			
		48-80	2-8	1.50-1.75	10.00-705.00	0.02-0.06	0.0-0.0	0.0-0.5	.10	.17			
184:													
Klinger--------------	100	0-8	25-30	1.30-1.35	1.00-10.00	0.22-0.24	2.6-4.2	5.0-6.0	.28	.28	5	7	38
		8-14	25-30	1.30-1.35	1.00-10.00	0.22-0.24	2.6-4.2	2.0-5.0	.28	.28			
		14-19	27-30	1.30-1.35	1.00-10.00	0.22-0.24	3.2-4.2	1.0-4.0	.28	.28			
		19-29	28-35	1.35-1.45	1.00-10.00	0.18-0.20	3.5-5.8	0.5-2.0	.43	.43			
		29-59	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.43	.43			
		59-79	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.43	.43			
198B:													
Floyd----------------	90	0-8	20-28	1.35-1.40	1.00-10.00	0.20-0.22	1.0-3.5	5.0-6.0	.24	.24	5	6	48
		8-24	20-28	1.35-1.40	1.00-10.00	0.20-0.22	1.0-3.5	2.0-5.0	.24	.24			
		24-33	18-24	1.40-1.60	1.00-10.00	0.16-0.18	0.4-2.3	1.0-2.0	.32	.32			
		33-41	6-24	1.35-1.40	1.00-10.00	0.11-0.13	0.0-2.3	0.5-1.0	.32	.32			
		41-50	18-30	1.75-1.90	0.01-1.00	0.16-0.18	0.4-4.2	0.0-1.0	.32	.32			
		50-80	18-30	1.75-1.90	0.01-1.00	0.16-0.18	0.4-4.2	0.0-0.5	.32	.32			

Physical Properties of the Soils--Continued

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodibility group	Wind erodibility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
221:													
Klossner-------------	100	0-10	25-30	0.30-0.40	0.10-10.00	0.35-0.45	---	50-100	.28	.28	5	2	134
		10-26	25-30	0.30-0.40	0.10-10.00	0.35-0.45	---	50-100	.28	.28			
		26-36	15-35	0.15-0.30	0.10-10.00	0.35-0.45	0.0-5.8	5.0-20	.37	.37			
		36-48	15-35	0.15-0.30	0.10-10.00	0.35-0.45	0.0-5.8	5.0-20	.37	.37			
		48-65	7-35	1.75-1.90	0.10-10.00	0.14-0.22	0.0-5.8	0.0-5.0	.37	.37			
		65-80	7-35	1.75-1.90	0.10-10.00	0.14-0.22	0.0-5.8	0.0-5.0	.37	.37			
284B:													
Flagler--------------	90	0-8	12-18	1.50-1.55	10.00-100.00	0.12-0.14	0.0-0.4	1.5-2.5	.20	.20	4	3	86
		8-15	12-18	1.50-1.55	10.00-100.00	0.12-0.14	0.0-0.4	1.0-2.5	.20	.20			
		15-22	12-18	1.50-1.55	10.00-100.00	0.12-0.14	0.0-0.4	1.0-2.5	.20	.20			
		22-33	10-15	1.55-1.60	10.00-100.00	0.11-0.13	0.0-0.0	0.0-1.0	.20	.20			
		33-65	2-8	1.60-1.75	100.00-705.00	0.02-0.04	0.0-0.0	0.0-0.5	.20	.20			
285:													
Burkhardt------------	100	0-8	5-13	1.35-1.55	1.00-100.00	0.11-0.15	0.0-0.0	1.5-2.5	.20	.20	2	3	86
		8-17	5-13	1.35-1.55	1.00-100.00	0.11-0.15	0.0-0.0	1.5-2.5	.20	.20			
		17-19	1-6	1.50-1.80	10.00-705.00	0.03-0.11	0.0-0.0	0.0-0.5	.10	.15			
		19-29	1-6	1.50-1.80	10.00-705.00	0.02-0.04	0.0-0.0	0.0-0.5	.10	.10			
		29-60	1-6	1.50-1.80	10.00-705.00	0.02-0.04	0.0-0.0	0.0-0.5	.10	.10			
285C:													
Burkhardt------------	100	0-8	5-13	1.35-1.55	1.00-100.00	0.11-0.15	0.0-0.0	1.5-2.5	.20	.20	2	3	86
		8-17	5-13	1.35-1.55	1.00-100.00	0.11-0.15	0.0-0.0	1.5-2.5	.20	.20			
		17-19	1-6	1.50-1.80	10.00-705.00	0.03-0.11	0.0-0.0	0.0-0.5	.10	.15			
		19-29	1-6	1.50-1.80	10.00-705.00	0.02-0.04	0.0-0.0	0.0-0.5	.10	.10			
		29-60	1-6	1.50-1.80	10.00-705.00	0.02-0.04	0.0-0.0	0.0-0.5	.10	.10			
323B:													
Fort Dodge-----------	85	0-8	20-26	1.35-1.40	1.00-100.00	0.20-0.22	1.0-2.9	3.0-4.0	.24	.24	5	6	48
		8-39	20-26	1.35-1.40	1.00-100.00	0.20-0.22	1.0-2.9	3.0-4.0	.24	.24			
		39-58	22-30	1.40-1.65	1.00-100.00	0.16-0.18	1.6-4.2	2.0-3.0	.28	.28			
		58-80	2-8	1.65-1.75	10.00-705.00	0.05-0.07	0.0-0.0	0.0-1.0	.10	.17			
344D:													
Copaston-------------	90	0-7	14-30	1.30-1.45	10.00-100.00	0.18-0.20	0.0-4.2	2.0-5.0	.28	.24	1	4L	86
		7-11	14-20	1.40-1.60	10.00-100.00	0.15-0.17	0.0-1.0	0.5-1.0	.28	.28			
		11-18	14-30	1.45-1.65	10.00-100.00	0.12-0.14	0.0-4.2	0.0-0.5	.28	.28			
		18-80	---	---	0.01-10.00	---	---	---	---	---			
344G:													
Copaston-------------	85	0-7	14-30	1.30-1.45	10.00-100.00	0.18-0.20	0.0-4.2	2.0-5.0	.28	.24	1	4L	86
		7-11	14-20	1.40-1.60	10.00-100.00	0.15-0.17	0.0-1.0	0.5-1.0	.28	.28			
		11-18	14-30	1.45-1.65	10.00-100.00	0.12-0.14	0.0-4.2	0.0-0.5	.28	.28			
		18-80	---	---	0.01-10.00	---	---	---	---	---			

Physical Properties of the Soils--Continued

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi- bility group	Wind erodi- bility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
354. Aquolls, ponded													
377B:													
Dinsdale-------------	90	0-8	25-29	1.25-1.30	1.00-10.00	0.21-0.23	2.6-3.9	3.0-4.0	.28	.28	5	7	38
		8-12	25-29	1.25-1.30	1.00-10.00	0.21-0.23	2.6-3.9	2.0-3.0	.28	.28			
		12-19	30-34	1.30-1.35	1.00-10.00	0.18-0.20	4.2-5.4	1.0-2.0	.28	.28			
		19-34	30-34	1.30-1.35	1.00-10.00	0.18-0.20	4.2-5.4	0.5-2.0	.43	.43			
		34-46	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.43	.43			
		46-80	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.43	.43			
377C:													
Dinsdale-------------	90	0-8	25-29	1.25-1.30	1.00-10.00	0.21-0.23	2.6-3.9	3.0-4.0	.28	.28	5	7	38
		8-12	25-29	1.25-1.30	1.00-10.00	0.21-0.23	2.6-3.9	2.0-3.0	.28	.28			
		12-19	30-34	1.30-1.35	1.00-10.00	0.18-0.20	4.2-5.4	1.0-2.0	.28	.28			
		19-34	30-34	1.30-1.35	1.00-10.00	0.18-0.20	4.2-5.4	0.5-2.0	.43	.43			
		34-46	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.43	.43			
		46-80	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.43	.43			
382:													
Maxfield-------------	100	0-8	27-35	1.35-1.40	1.00-10.00	0.21-0.23	3.2-5.8	6.0-8.0	.28	.28	5	7	38
		8-19	27-35	1.35-1.40	1.00-10.00	0.21-0.23	3.2-5.8	3.0-6.0	.28	.28			
		19-29	25-34	1.40-1.50	1.00-10.00	0.18-0.20	2.6-5.4	0.5-2.0	.32	.32			
		29-55	20-35	1.75-1.90	0.01-1.00	0.17-0.19	1.0-5.8	0.0-0.5	.32	.32			
		55-80	20-35	1.75-1.90	0.01-1.00	0.17-0.19	1.0-5.8	0.0-0.5	.32	.32			
391B:													
Clyde----------------	60	0-8	25-32	1.35-1.40	1.00-10.00	0.21-0.23	2.6-4.8	6.0-9.0	.28	.28	5	7	48
		8-17	28-32	1.35-1.40	1.00-10.00	0.21-0.23	3.5-4.8	2.0-6.0	.28	.28			
		17-23	28-32	1.35-1.40	1.00-10.00	0.21-0.23	3.5-4.8	1.0-4.0	.28	.28			
		23-28	22-30	1.45-1.65	1.00-10.00	0.18-0.20	1.6-4.2	0.5-2.0	.37	.37			
		28-41	22-30	1.45-1.65	1.00-10.00	0.18-0.20	1.6-4.2	0.5-2.0	.37	.37			
		41-44	10-15	1.60-1.70	1.00-10.00	0.11-0.13	0.0-0.0	0.5-1.0	.37	.37			
		44-62	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.37	.37			
		62-66	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.37	.37			
Floyd----------------	35	0-8	20-28	1.35-1.40	1.00-10.00	0.20-0.22	1.0-3.5	5.0-6.0	.24	.24	5	7	48
		8-24	20-28	1.35-1.40	1.00-10.00	0.20-0.22	1.0-3.5	2.0-5.0	.24	.24			
		24-33	18-24	1.40-1.60	1.00-10.00	0.16-0.18	0.4-2.3	1.0-2.0	.32	.32			
		33-41	6-24	1.35-1.40	1.00-10.00	0.11-0.13	0.0-2.3	0.5-1.0	.32	.32			
		41-50	18-30	1.75-1.90	0.01-1.00	0.16-0.18	0.4-4.2	0.0-1.0	.32	.32			
		50-80	18-30	1.75-1.90	0.01-1.00	0.16-0.18	0.4-4.2	0.0-0.5	.32	.32			

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi- bility group	Wind erodi- bility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
394B:													
Ostrander------------	75	0-8	18-27	1.45-1.55	1.00-10.00	0.20-0.24	0.4-3.2	3.0-4.0	.28	.28	5	6	48
		8-19	18-27	1.45-1.55	1.00-10.00	0.20-0.24	0.4-3.2	3.0-4.0	.28	.28			
		19-31	18-27	1.45-1.55	1.00-10.00	0.17-0.20	0.4-3.2	1.0-2.0	.28	.28			
		31-45	18-30	1.75-1.90	0.01-1.00	0.17-0.19	0.4-4.2	0.0-0.5	.37	.37			
		45-79	18-30	1.75-1.90	0.01-1.00	0.17-0.19	0.4-4.2	0.0-0.5	.37	.37			
394C:													
Ostrander------------	85	0-8	18-27	1.45-1.55	1.00-10.00	0.20-0.24	0.4-3.2	3.0-4.0	.28	.28	5	6	48
		8-19	18-27	1.45-1.55	1.00-10.00	0.20-0.24	0.4-3.2	3.0-4.0	.28	.28			
		19-31	18-27	1.45-1.55	1.00-10.00	0.17-0.20	0.4-3.2	1.0-2.0	.28	.28			
		31-45	18-30	1.75-1.90	0.01-1.00	0.17-0.19	0.4-4.2	0.0-0.5	.37	.37			
		45-79	18-30	1.75-1.90	0.01-1.00	0.17-0.19	0.4-4.2	0.0-0.5	.37	.37			
395B:													
Marquis--------------	80	0-8	18-26	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.9	3.0-4.0	.24	.24	5	6	48
		8-19	18-26	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.9	3.0-4.0	.24	.24			
		19-24	20-30	1.45-1.65	1.00-10.00	0.17-0.19	1.0-4.2	1.0-2.0	.28	.28			
		24-54	20-24	1.75-1.90	0.01-1.00	0.17-0.19	1.0-2.3	0.0-1.0	.37	.37			
		54-80	20-24	1.75-1.90	0.01-1.00	0.17-0.19	1.0-2.3	0.0-0.5	.37	.37			
398:													
Tripoli--------------	90	0-8	28-32	1.40-1.45	1.00-10.00	0.19-0.21	3.5-4.8	6.0-7.0	.24	.24	5	6	48
		8-18	28-32	1.40-1.45	1.00-10.00	0.19-0.21	3.5-4.8	4.0-6.0	.24	.24			
		18-24	22-28	1.45-1.70	1.00-10.00	0.17-0.19	1.6-3.5	0.5-2.0	.24	.24			
		24-38	22-28	1.75-1.90	0.01-1.00	0.17-0.19	1.6-3.5	0.0-1.0	.28	.28			
		38-66	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.28	.28			
399:													
Readlyn--------------	85	0-8	18-28	1.35-1.40	1.00-10.00	0.20-0.22	0.4-3.5	4.5-5.5	.24	.24	5	6	48
		8-19	18-28	1.35-1.40	1.00-10.00	0.20-0.22	0.4-3.5	3.0-4.5	.24	.24			
		19-24	22-28	1.45-1.70	1.00-10.00	0.17-0.19	1.6-3.5	1.0-3.0	.32	.32			
		24-46	22-28	1.75-1.90	0.01-1.00	0.17-0.19	1.6-3.5	0.5-2.0	.24	.24			
		46-79	18-24	1.75-1.90	0.01-1.00	0.17-0.19	0.4-2.3	0.0-0.5	.32	.32			
408B:													
Olin-----------------	80	0-8	12-18	1.45-1.50	10.00-100.00	0.13-0.15	0.0-0.4	1.5-2.5	.20	.20	5	3	86
		8-19	12-18	1.45-1.50	10.00-100.00	0.13-0.15	0.0-0.4	1.0-2.0	.20	.20			
		19-31	12-18	1.45-1.50	10.00-100.00	0.13-0.15	0.0-0.4	0.0-1.0	.20	.20			
		31-53	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.37	.37			
		53-80	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.37	.37			

Physical Properties of the Soils--Continued

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
471:													
Oran-----------------	85	0-8	16-24	1.40-1.45	1.00-10.00	0.18-0.20	0.0-2.3	3.0-4.0	.24	.24	5	6	48
		8-13	16-24	1.40-1.45	1.00-10.00	0.18-0.20	0.0-2.3	0.5-1.0	.32	.32			
		13-18	16-24	1.40-1.45	1.00-10.00	0.18-0.20	0.0-2.3	0.5-1.0	.32	.32			
		18-45	22-30	1.75-1.90	0.01-1.00	0.17-0.19	1.6-4.2	0.0-0.5	.37	.37			
		45-80	20-26	1.75-1.90	0.01-1.00	0.17-0.19	1.0-2.9	0.0-0.5	.37	.37			
485:													
Spillville, occasionally flooded	80	0-8	18-26	1.45-1.55	1.00-10.00	0.19-0.21	0.4-2.9	4.0-5.0	.24	.24	5	6	48
		8-54	18-26	1.45-1.55	1.00-10.00	0.19-0.21	0.4-2.9	1.0-4.0	.24	.24			
		54-79	14-24	1.55-1.70	1.00-10.00	0.15-0.18	0.0-2.3	1.0-2.0	.28	.28			
582B:													
Kasson---------------	90	0-8	18-25	1.45-1.50	1.00-10.00	0.19-0.21	0.4-2.6	2.5-3.5	.28	.28	5	6	48
		8-11	18-25	1.45-1.50	1.00-10.00	0.19-0.21	0.4-2.6	0.5-1.0	.28	.28			
		11-20	20-28	1.65-1.75	1.00-10.00	0.17-0.19	1.0-3.5	0.0-0.5	.28	.28			
		20-41	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.28	.28			
		41-53	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.28	.28			
		53-69	20-24	1.75-1.90	0.01-1.00	0.17-0.19	1.0-2.3	0.0-0.5	.37	.37			
		69-80	20-24	1.75-1.90	0.01-1.00	0.17-0.19	1.0-2.3	0.0-0.5	.37	.37			
582C:													
Kasson---------------	80	0-8	18-25	1.45-1.50	1.00-10.00	0.19-0.21	0.4-2.6	2.5-3.5	.28	.28	5	6	48
		8-11	18-25	1.45-1.50	1.00-10.00	0.19-0.21	0.4-2.6	0.5-1.0	.28	.28			
		11-20	20-28	1.65-1.75	1.00-10.00	0.17-0.19	1.0-3.5	0.0-0.5	.28	.28			
		20-41	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.28	.28			
		41-53	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.28	.28			
		53-69	20-24	1.75-1.90	0.01-1.00	0.17-0.19	1.0-2.3	0.0-0.5	.37	.37			
		69-80	20-24	1.75-1.90	0.01-1.00	0.17-0.19	1.0-2.3	0.0-0.5	.37	.37			
585:													
Spillville, occasionally flooded	50	0-8	18-26	1.45-1.55	1.00-10.00	0.19-0.21	0.4-2.9	4.0-5.0	.24	.24	5	6	48
		8-54	18-26	1.45-1.55	1.00-10.00	0.19-0.21	0.4-2.9	1.0-4.0	.24	.24			
		54-80	14-24	1.55-1.70	1.00-10.00	0.15-0.18	0.0-2.3	1.0-2.0	.28	.28			
Coland, occasionally flooded-------------	30	0-8	27-35	1.40-1.50	1.00-10.00	0.20-0.22	3.2-5.8	5.0-7.0	.24	.24	5	6	48
		8-32	27-35	1.40-1.50	1.00-10.00	0.20-0.22	3.2-5.8	3.0-6.0	.24	.24			
		32-40	25-35	1.40-1.50	1.00-10.00	0.20-0.22	2.6-5.8	2.0-4.0	.24	.24			
		40-44	12-28	1.50-1.65	1.00-10.00	0.13-0.17	0.0-3.5	0.0-2.0	.28	.28			
		44-52	12-28	1.50-1.65	1.00-10.00	0.13-0.17	0.0-3.5	0.0-2.0	.28	.28			
		52-60	12-28	1.50-1.65	1.00-10.00	0.13-0.17	0.0-3.5	0.0-1.0	.28	.28			

Physical Properties of the Soils--Continued

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi- bility group	Wind erodi- bility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
620B:													
Port Byron-----------	90	0-8	10-20	1.25-1.40	1.00-10.00	0.22-0.24	0.0-1.0	3.0-4.0	.37	.37	5	6	48
		8-13	10-20	1.30-1.45	1.00-10.00	0.20-0.22	0.0-1.0	1.0-2.0	.37	.37			
		13-31	15-30	1.40-1.55	1.00-10.00	0.18-0.22	0.0-4.2	0.0-1.0	.37	.37			
		31-52	12-27	1.40-1.55	1.00-10.00	0.20-0.22	0.0-3.2	0.0-1.0	.37	.37			
		52-59	8-18	1.45-1.60	1.00-10.00	0.14-0.22	0.0-0.4	0.0-0.5	.32	.32			
		59-80	8-18	1.45-1.60	1.00-10.00	0.14-0.22	0.0-0.4	0.0-0.5	.32	.32			
620C2:													
Port Byron-----------	100	0-8	10-20	1.25-1.40	1.00-10.00	0.22-0.24	0.0-1.0	1.0-3.0	.37	.37	5	6	48
		8-31	15-30	1.40-1.55	1.00-10.00	0.18-0.22	0.0-4.2	0.0-1.0	.37	.37			
		31-52	12-27	1.40-1.55	1.00-10.00	0.20-0.22	0.0-3.2	0.0-1.0	.37	.37			
		52-59	8-18	1.45-1.60	1.00-10.00	0.14-0.22	0.0-0.4	0.0-0.5	.32	.32			
		59-80	8-18	1.45-1.60	1.00-10.00	0.14-0.22	0.0-0.4	0.0-0.5	.32	.32			
626:													
Hayfield, rarely flooded-------------	90	0-8	18-27	1.30-1.50	1.00-10.00	0.20-0.24	0.4-3.2	3.0-4.0	.32	.32	4	6	48
		8-13	18-27	1.30-1.50	1.00-10.00	0.20-0.24	0.4-3.2	0.5-1.0	.32	.32			
		13-29	18-30	1.40-1.55	1.00-10.00	0.17-0.22	0.4-4.2	0.0-1.0	.32	.32			
		29-80	0-5	1.55-1.65	10.00-705.00	0.02-0.04	0.0-0.0	0.0-0.5	.15	.15			
663B:													
Seaton---------------	100	0-8	12-22	1.25-1.40	1.00-10.00	0.22-0.24	0.0-1.6	1.0-2.0	.37	.37	5	6	56
		8-15	12-22	1.25-1.40	1.00-10.00	0.20-0.22	0.0-1.6	0.5-1.0	.37	.37			
		15-44	14-27	1.40-1.55	1.00-10.00	0.20-0.22	0.0-3.2	0.0-0.5	.37	.37			
		44-70	10-20	1.45-1.60	1.00-10.00	0.20-0.22	0.0-1.0	0.0-0.5	.37	.37			
		70-80	10-20	1.45-1.60	1.00-10.00	0.20-0.22	0.0-1.0	0.0-0.5	.37	.37			
663C:													
Seaton---------------	100	0-8	12-22	1.25-1.40	1.00-10.00	0.22-0.24	0.0-1.6	1.0-2.0	.37	.37	5	6	56
		8-15	12-22	1.25-1.40	1.00-10.00	0.20-0.22	0.0-1.6	0.5-1.0	.37	.37			
		15-44	14-27	1.40-1.55	1.00-10.00	0.20-0.22	0.0-3.2	0.0-0.5	.37	.37			
		44-70	10-20	1.45-1.60	1.00-10.00	0.20-0.22	0.0-1.0	0.0-0.5	.37	.37			
		70-80	10-20	1.45-1.60	1.00-10.00	0.20-0.22	0.0-1.0	0.0-0.5	.37	.37			
663D2:													
Seaton, moderately eroded--------------	90	0-8	12-22	1.25-1.40	1.00-10.00	0.22-0.24	0.0-1.6	0.8-2.0	.37	.37	5	6	56
		8-44	14-27	1.40-1.55	1.00-10.00	0.20-0.22	0.0-3.2	0.0-0.5	.37	.37			
		44-70	10-20	1.45-1.60	1.00-10.00	0.20-0.22	0.0-1.0	0.0-0.5	.37	.37			
		70-80	10-20	1.45-1.60	1.00-10.00	0.20-0.22	0.0-1.0	0.0-0.5	.37	.37			

Physical Properties of the Soils--Continued

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi-bility group	Wind erodi-bility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
663D3:													
Seaton, severely eroded--------------	90	0-8	12-22	1.25-1.40	1.00-10.00	0.22-0.24	0.0-1.6	0.2-1.0	.37	.37	4	6	56
		8-44	14-27	1.40-1.55	1.00-10.00	0.20-0.22	0.0-3.2	0.0-0.5	.37	.37			
		44-70	10-20	1.45-1.60	1.00-10.00	0.20-0.22	0.0-1.0	0.0-0.5	.37	.37			
		70-95	10-20	1.45-1.60	1.00-10.00	0.20-0.22	0.0-1.0	0.0-0.5	.37	.37			
663E2:													
Seaton, moderately eroded--------------	90	0-8	12-22	1.25-1.40	1.00-10.00	0.22-0.24	0.0-1.6	0.8-2.0	.37	.37	5	6	56
		8-44	14-27	1.40-1.55	1.00-10.00	0.20-0.22	0.0-3.2	0.0-0.5	.37	.37			
		44-70	10-20	1.45-1.60	1.00-10.00	0.20-0.22	0.0-1.0	0.0-0.5	.37	.37			
		70-80	10-20	1.45-1.60	1.00-10.00	0.20-0.22	0.0-1.0	0.0-0.5	.37	.37			
663G:													
Seaton---------------	90	0-4	12-22	1.25-1.40	1.00-10.00	0.22-0.24	0.0-1.6	1.0-2.0	.37	.37	5	6	56
		4-9	12-22	1.25-1.40	1.00-10.00	0.20-0.22	0.0-1.6	0.5-1.0	.37	.37			
		9-44	14-27	1.40-1.55	1.00-10.00	0.20-0.22	0.0-3.2	0.0-0.5	.37	.37			
		44-70	10-20	1.45-1.60	1.00-10.00	0.20-0.22	0.0-1.0	0.0-0.5	.37	.37			
		70-80	10-20	1.45-1.60	1.00-10.00	0.20-0.22	0.0-1.0	0.0-0.5	.37	.37			
775:													
Billett--------------	100	0-8	5-15	1.40-1.70	10.00-100.00	0.13-0.18	0.0-0.0	1.0-2.0	.20	.20	4	3	86
		8-13	10-18	1.40-1.70	10.00-100.00	0.10-0.15	0.0-0.4	0.5-1.0	.20	.20			
		13-28	10-18	1.40-1.70	10.00-100.00	0.10-0.15	0.0-0.4	0.0-0.5	.15	.15			
		28-41	8-18	1.50-1.80	10.00-100.00	0.05-0.12	0.0-0.4	0.0-0.5	.15	.15			
		41-47	8-18	1.50-1.80	10.00-100.00	0.05-0.12	0.0-0.4	0.0-0.5	.15	.15			
		47-52	2-7	1.60-1.90	100.00-705.00	0.02-0.10	0.0-0.0	0.0-0.5	.10	.10			
		52-60	2-7	1.60-1.90	100.00-705.00	0.02-0.10	0.0-0.0	0.0-0.5	.10	.10			
775B:													
Billett--------------	100	0-8	5-15	1.40-1.70	10.00-100.00	0.13-0.18	0.0-0.0	1.0-2.0	.20	.20	4	3	86
		8-13	10-18	1.40-1.70	10.00-100.00	0.10-0.15	0.0-0.4	0.5-1.0	.20	.20			
		13-28	10-18	1.40-1.70	10.00-100.00	0.10-0.15	0.0-0.4	0.0-0.5	.15	.15			
		28-41	8-18	1.50-1.80	10.00-100.00	0.05-0.12	0.0-0.4	0.0-0.5	.15	.15			
		41-47	8-18	1.50-1.80	10.00-100.00	0.05-0.12	0.0-0.4	0.0-0.5	.15	.15			
		47-52	2-7	1.60-1.90	100.00-705.00	0.02-0.10	0.0-0.0	0.0-0.5	.10	.10			
		52-60	2-7	1.60-1.90	100.00-705.00	0.02-0.10	0.0-0.0	0.0-0.5	.10	.10			

Physical Properties of the Soils--Continued

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi- bility group	Wind erodi- bility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
775C:													
Billett--------------	100	0-8	5-15	1.40-1.70	10.00-100.00	0.13-0.18	0.0-0.0	1.0-2.0	.20	.20	4	3	86
		8-13	10-18	1.40-1.70	10.00-100.00	0.10-0.15	0.0-0.4	0.5-1.0	.20	.20			
		13-28	10-18	1.40-1.70	10.00-100.00	0.10-0.15	0.0-0.4	0.0-0.5	.15	.15			
		28-41	8-18	1.50-1.80	10.00-100.00	0.05-0.12	0.0-0.4	0.0-0.5	.15	.15			
		41-47	8-18	1.50-1.80	10.00-100.00	0.05-0.12	0.0-0.4	0.0-0.5	.15	.15			
		47-52	2-7	1.60-1.90	100.00-705.00	0.02-0.10	0.0-0.0	0.0-0.5	.10	.10			
		52-60	2-7	1.60-1.90	100.00-705.00	0.02-0.10	0.0-0.0	0.0-0.5	.10	.10			
778:													
Sattre, rarely flooded-------------	85	0-8	18-24	1.40-1.45	1.00-10.00	0.18-0.20	0.4-2.3	2.0-3.0	.24	.24	4	6	48
		8-13	18-24	1.40-1.45	1.00-10.00	0.18-0.20	0.4-2.3	1.0-2.0	.24	.24			
		13-17	18-28	1.40-1.50	1.00-10.00	0.15-0.17	0.4-3.5	0.5-1.0	.28	.28			
		17-32	18-28	1.40-1.50	1.00-10.00	0.15-0.17	0.4-3.5	0.5-1.0	.28	.28			
		32-35	18-28	1.40-1.50	1.00-10.00	0.15-0.17	0.4-3.5	0.5-1.0	.28	.28			
		35-60	2-8	1.50-1.75	10.00-705.00	0.02-0.06	0.0-0.0	0.0-0.5	.10	.20			
813B:													
Atkinson-------------	90	0-8	18-24	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.3	3.0-4.0	.24	.24	3	6	48
		8-13	18-24	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.3	2.0-4.0	.24	.24			
		13-24	24-32	1.45-1.70	1.00-10.00	0.17-0.19	2.3-4.8	1.0-2.0	.32	.32			
		24-45	20-35	1.45-1.70	1.00-10.00	0.17-0.19	1.0-5.8	1.0-2.0	.32	.32			
		45-50	40-50	1.50-1.60	0.01-1.00	0.12-0.15	7.3-10.5	0.0-0.5	.32	.32			
		50-80	---	---	0.01-10.00	---	---	---	---	---			
813C:													
Atkinson-------------	85	0-8	18-24	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.3	3.0-4.0	.24	.24	3	6	48
		8-13	18-24	1.40-1.45	1.00-10.00	0.20-0.22	0.4-2.3	2.0-4.0	.24	.24			
		13-24	24-32	1.45-1.70	1.00-10.00	0.17-0.19	2.3-4.8	1.0-2.0	.32	.32			
		24-45	20-35	1.45-1.70	1.00-10.00	0.17-0.19	1.0-5.8	1.0-2.0	.32	.32			
		45-50	40-50	1.50-1.60	0.01-1.00	0.12-0.15	7.3-10.5	0.0-0.5	.32	.32			
		50-80	---	---	0.01-10.00	---	---	---	---	---			
814B:													
Rockton--------------	90	0-8	18-27	1.30-1.40	1.00-10.00	0.20-0.22	0.4-3.2	3.0-4.0	.28	.28	3	6	48
		8-15	18-27	1.30-1.40	1.00-10.00	0.20-0.22	0.4-3.2	3.0-4.0	.28	.28			
		15-26	25-35	1.40-1.55	1.00-10.00	0.17-0.19	2.6-5.8	0.5-1.0	.28	.28			
		26-31	35-60	1.35-1.45	0.01-1.00	0.10-0.14	5.8-13.7	0.0-0.5	.28	.28			
		31-80	---	---	0.01-10.00	---	---	---	---	---			

Physical Properties of the Soils--Continued

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi-bility group	Wind erodi-bility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
814C:													
Rockton--------------	85	0-8	18-27	1.30-1.40	1.00-10.00	0.20-0.22	0.4-3.2	3.0-4.0	.28	.28	3	6	48
		8-15	18-27	1.30-1.40	1.00-10.00	0.20-0.22	0.4-3.2	3.0-4.0	.28	.28			
		15-26	25-35	1.40-1.55	1.00-10.00	0.17-0.19	2.6-5.8	0.5-1.0	.28	.28			
		26-31	35-60	1.35-1.45	0.01-1.00	0.10-0.14	5.8-13.7	0.0-0.5	.28	.28			
		31-80	---	---	0.01-10.00	---	---	---	---	---			
814D:													
Rockton--------------	90	0-8	18-27	1.30-1.40	1.00-10.00	0.20-0.22	0.4-3.2	3.0-4.0	.28	.28	3	6	48
		8-15	18-27	1.30-1.40	1.00-10.00	0.20-0.22	0.4-3.2	3.0-4.0	.28	.28			
		15-26	25-35	1.40-1.55	1.00-10.00	0.17-0.19	2.6-5.8	0.5-1.0	.28	.28			
		26-31	35-60	1.35-1.45	0.01-1.00	0.10-0.14	5.8-13.7	0.0-0.5	.28	.28			
		31-80	---	---	0.01-10.00	---	---	---	---	---			
884:													
Klingmore------------	100	0-8	26-30	1.30-1.35	1.00-10.00	0.22-0.24	2.9-4.2	5.0-6.0	.28	.28	5	6	38
		8-19	26-30	1.30-1.35	1.00-10.00	0.22-0.24	2.9-4.2	4.0-5.0	.28	.28			
		19-56	26-35	1.35-1.45	1.00-10.00	0.18-0.20	2.9-5.8	0.5-1.0	.37	.37			
		56-80	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.43	.43			
930:													
Orion, occasionally flooded------------	100	0-8	8-18	1.20-1.55	1.00-10.00	0.22-0.24	0.0-0.4	1.0-3.0	.37	.37	5	5	56
		8-32	8-18	1.20-1.55	1.00-10.00	0.20-0.22	0.0-0.4	1.0-3.0	.37	.37			
		32-39	8-30	1.25-1.45	1.00-10.00	0.18-0.22	0.0-4.2	3.0-8.0	.37	.37			
		39-60	8-18	1.20-1.40	1.00-10.00	0.18-0.22	0.0-0.4	0.0-0.5	.37	.37			
982:													
Maxmore--------------	100	0-8	25-35	1.35-1.40	1.00-10.00	0.21-0.23	2.6-5.8	6.0-8.0	.28	.28	5	7	38
		8-20	25-35	1.35-1.40	1.00-10.00	0.21-0.23	2.6-5.8	3.0-6.0	.28	.28			
		20-50	25-35	1.40-1.50	1.00-10.00	0.18-0.20	2.6-5.8	0.5-2.0	.32	.32			
		50-80	20-28	1.75-1.90	0.01-1.00	0.17-0.19	1.0-3.5	0.0-0.5	.32	.32			
1152:													
Marshan, rarely flooded------------	75	0-8	25-35	1.30-1.40	1.00-10.00	0.20-0.22	2.6-5.8	5.0-6.0	.28	.28	4	6	48
		8-14	25-35	1.30-1.40	1.00-10.00	0.20-0.22	2.6-5.8	2.0-5.0	.28	.28			
		14-18	25-35	1.40-1.55	1.00-10.00	0.17-0.22	2.6-5.8	1.0-3.0	.28	.28			
		18-23	25-35	1.40-1.55	1.00-10.00	0.17-0.22	2.6-5.8	0.5-1.0	.28	.28			
		23-30	18-30	1.45-1.55	1.00-10.00	0.15-0.19	0.4-4.2	0.5-1.0	.28	.28			
		30-40	0-5	1.55-1.65	10.00-705.00	0.02-0.05	0.0-0.0	0.0-0.5	.15	.15			
		40-60	0-5	1.55-1.65	10.00-705.00	0.02-0.05	0.0-0.0	0.0-0.5	.15	.15			

Physical Properties of the Soils--Continued

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
1226:													
Lawler, rarely flooded-------------	80	0-8	18-27	1.40-1.45	1.00-10.00	0.20-0.22	0.4-3.2	4.0-5.0	.24	.24	4	6	48
		8-19	18-27	1.40-1.45	1.00-10.00	0.20-0.22	0.4-3.2	2.5-4.0	.24	.24			
		19-38	20-28	1.45-1.60	1.00-10.00	0.16-0.18	1.0-3.5	0.5-2.0	.28	.28			
		38-80	0-5	1.55-1.65	10.00-705.00	0.02-0.05	0.0-0.0	0.0-0.5	.15	.15			
1585:													
Spillville, channeled	40	0-54	18-26	1.45-1.55	1.00-10.00	0.19-0.21	0.4-2.9	4.0-5.0	.24	.24	5	6	48
		54-80	14-24	1.55-1.70	1.00-10.00	0.15-0.18	0.0-2.3	1.0-2.0	.28	.28			
Coland, channeled----	35	0-32	27-35	1.40-1.50	1.00-10.00	0.20-0.22	3.2-5.8	5.0-7.0	.24	.24	5	6	48
		32-40	25-35	1.40-1.50	1.00-10.00	0.20-0.22	2.6-5.8	2.0-4.0	.24	.24			
		40-44	12-28	1.50-1.65	1.00-10.00	0.13-0.17	0.0-3.5	0.0-2.0	.28	.28			
		44-52	12-28	1.50-1.65	1.00-10.00	0.13-0.17	0.0-3.5	0.0-2.0	.28	.28			
		52-60	12-28	1.50-1.65	1.00-10.00	0.13-0.17	0.0-3.5	0.0-1.0	.28	.28			
Aquolls, ponded.													
1586:													
Sigglekov, frequently flooded-------------	55	0-9	10-15	1.50-1.55	10.00-100.00	0.12-0.15	0.0-0.0	0.5-1.5	.24	.24	5	3	86
		9-15	2-10	1.50-1.75	10.00-100.00	0.02-0.04	0.0-0.0	0.0-0.5	.15	.15			
		15-35	2-10	1.50-1.75	10.00-100.00	0.02-0.04	0.0-0.0	0.0-0.5	.15	.15			
		35-80	2-10	1.50-1.75	10.00-100.00	0.02-0.04	0.0-0.0	0.0-0.5	.15	.15			
Fluvaquents, frequently flooded.													
Aquents, ponded.													
4946.													
Udorthents-Interstate highway													
5010.													
Pits, sand and gravel													
5030.													
Pits, limestone quarries													
5040.													
Udorthents, loamy													

Physical Properties of the Soils--Continued

Map symbol and soil name	Pct. of map unit	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi-bility group	Wind erodi-bility index
		In	Pct	g/cc	um/sec	In/in	Pct	Pct					
5080.													
Udorthents, sanitary landfill													
8041:													
Sparta, terrace, rarely flooded------	80	0-8	3-10	1.20-1.40	10.00-705.00	0.09-0.12	0.0-0.0	1.0-2.0	.17	.17	5	2	134
		8-15	3-10	1.20-1.40	10.00-705.00	0.09-0.12	0.0-0.0	0.5-1.0	.17	.17			
		15-72	1-8	1.40-1.60	10.00-705.00	0.05-0.11	0.0-0.0	0.0-0.5	.15	.15			
		72-80	0-9	1.50-1.70	10.00-705.00	0.04-0.07	0.0-0.0	0.0-0.5	.15	.15			
8041B:													
Sparta, terrace, rarely flooded------	80	0-8	3-10	1.20-1.40	10.00-705.00	0.09-0.12	0.0-0.0	1.0-2.0	.17	.17	5	2	134
		8-15	3-10	1.20-1.40	10.00-705.00	0.09-0.12	0.0-0.0	0.5-1.0	.17	.17			
		15-72	1-8	1.40-1.60	10.00-705.00	0.05-0.11	0.0-0.0	0.0-0.5	.15	.15			
		72-80	0-9	1.50-1.70	10.00-705.00	0.04-0.07	0.0-0.0	0.0-0.5	.15	.15			
8175B:													
Dickinson, terrace, rarely flooded------	100	0-8	12-18	1.50-1.55	10.00-100.00	0.12-0.15	0.0-0.4	1.5-2.5	.20	.20	4	3	86
		8-18	10-18	1.45-1.55	10.00-100.00	0.12-0.15	0.0-0.4	0.5-2.5	.20	.20			
		18-30	10-18	1.45-1.55	10.00-100.00	0.12-0.15	0.0-0.4	0.0-0.5	.20	.20			
		30-36	5-10	1.55-1.65	100.00-705.00	0.08-0.10	0.0-0.0	0.0-0.5	.20	.20			
		36-60	5-10	1.60-1.70	100.00-705.00	0.02-0.04	0.0-0.0	0.0-0.5	.15	.15			
AW.													
Animal waste lagoon													
SL.													
Sewage lagoon													
W.													
Water													

Chemical Properties

The table described in this section shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Chemical Properties of the Soils

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate
	In	meq/100 g	pH	Pct
41B:				
Sparta---------------	0-8	3.6-10.0	5.1-7.3	0
	8-15	3.3-9.2	5.1-7.3	0
	15-72	0.8-5.8	5.1-6.5	0
	72-80	0.0-3.8	5.1-6.0	0
41C:				
Sparta---------------	0-8	3.6-10.0	5.1-7.3	0
	8-15	3.3-9.2	5.1-7.3	0
	15-72	0.8-5.8	5.1-6.5	0
	72-80	0.0-3.8	5.1-6.0	0
43:				
Bremer---------------	0-8	23-29	5.6-7.3	0
	8-19	22-29	5.6-7.3	0
	19-42	27-32	5.6-6.5	0
	42-60	24-29	5.6-6.5	0
50B:				
Coloma---------------	0-8	0.0-8.2	4.5-6.5	0
	8-39	0.0-10	4.5-6.5	0
	39-80	0.0-9.9	4.5-7.3	0
63B:				
Chelsea--------------	0-8	6.1-11	5.6-7.3	0
	8-15	3.1-7.4	5.1-6.5	0
	15-36	3.1-7.4	5.1-6.5	0
	36-70	3.1-7.4	5.1-6.5	0
63C:				
Chelsea--------------	0-8	6.1-11	5.6-7.3	0
	8-15	3.1-7.4	5.1-6.5	0
	15-36	3.1-7.4	5.1-6.5	0
	36-70	3.1-7.4	5.1-6.5	0
63E:				
Chelsea--------------	0-8	6.1-11	5.6-7.3	0
	8-15	3.1-7.4	5.1-6.5	0
	15-36	3.1-7.4	5.1-6.5	0
	36-70	3.1-7.4	5.1-6.5	0
83B:				
Kenyon---------------	0-8	16-22	5.6-7.3	0
	8-14	16-22	5.6-7.3	0
	14-19	15-22	5.6-7.3	0
	19-55	14-24	5.1-7.3	0
	55-79	14-19	6.6-8.4	0-25
83C:				
Kenyon---------------	0-8	16-22	5.6-7.3	0
	8-14	16-22	5.6-7.3	0
	14-19	15-22	5.6-7.3	0
	19-55	14-24	5.1-7.3	0
	55-79	14-19	6.6-8.4	0-25

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate
	In	meq/100 g	pH	Pct
84:				
Clyde----------------	0-8	22-28	6.6-7.3	0
	8-17	23-27	6.6-7.3	0
	17-23	22-27	6.6-7.3	0
	23-28	18-25	6.1-7.3	0
	28-41	18-25	6.1-7.3	0
	41-44	8.6-13	6.1-7.3	0
	44-62	14-22	6.6-8.4	0-25
	62-66	14-22	6.6-8.4	0-25
109B:				
Backbone-------------	0-8	7.3-16	5.6-7.3	0
	8-24	10-15	5.1-7.3	0
	24-30	14-30	5.1-6.0	0
	30-80	---	---	---
109C:				
Backbone-------------	0-8	7.3-16	5.6-7.3	0
	8-24	10-15	5.1-7.3	0
	24-30	14-30	5.1-6.0	0
	30-80	---	---	---
109D:				
Backbone-------------	0-8	7.3-16	5.6-7.3	0
	8-24	10-15	5.1-7.3	0
	24-30	14-30	5.1-6.0	0
	30-80	---	---	---
127:				
Plano, rarely flooded	0-8	17-29	6.1-7.3	0
	8-14	17-29	6.1-7.3	0
	14-43	16-27	5.1-7.3	0
	43-49	17-23	5.6-7.3	0
	49-53	11-25	5.6-7.3	0
	53-60	4.1-16	5.6-7.8	0-15
	60-72	4.1-16	5.6-8.4	0-25
135:				
Coland, occasionally flooded-------------	0-8	23-30	6.1-7.3	0
	8-32	23-29	6.1-7.3	0
	32-40	21-29	6.1-7.3	0
	40-44	8.9-23	6.1-7.8	0-15
	44-52	8.9-23	6.1-7.8	0-15
	52-60	8.9-22	6.1-7.8	0-15
153:				
Shandep, ponded, occasionally flooded	0-8	23-28	6.1-7.3	0
	8-29	23-28	6.1-7.3	0
	29-37	21-26	6.1-7.3	0
	37-45	6.2-10	6.1-7.8	0-15
	45-60	1.8-7.1	6.1-8.4	0-25
173:				
Hoopeston, rarely flooded-------------	0-8	7.0-16	5.1-7.3	0
	8-14	7.0-16	5.1-7.3	0
	14-38	10-15	5.1-7.8	0-15
	38-60	2.0-9.0	4.5-8.4	0-25

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate
	In	meq/100 g	pH	Pct
175B:				
Dickinson------------	0-8	11-16	5.6-7.3	0
	8-18	8.6-16	5.1-6.5	0
	18-30	7.6-15	5.1-6.5	0
	30-36	4.1-8.6	5.1-6.5	0
	36-60	4.1-8.6	5.6-6.5	0
175C:				
Dickinson------------	0-8	11-16	5.6-7.3	0
	8-18	8.6-16	5.1-6.5	0
	18-30	7.6-15	5.1-6.5	0
	30-36	4.1-8.6	5.1-6.5	0
	36-60	4.1-8.6	5.6-6.5	0
178:				
Waukee, rarely flooded-------------	0-8	16-21	5.6-6.5	0
	8-18	16-20	5.6-6.5	0
	18-33	15-22	5.1-6.0	0
	33-48	1.8-7.1	5.6-6.5	0
	48-80	1.8-7.1	5.6-6.5	0
178B:				
Waukee, rarely flooded-------------	0-8	16-21	5.6-6.5	0
	8-18	16-20	5.6-6.5	0
	18-33	15-22	5.1-6.0	0
	33-48	1.8-7.1	5.6-6.5	0
	48-80	1.8-7.1	5.6-6.5	0
178C:				
Waukee, rarely flooded-------------	0-8	16-21	5.6-6.5	0
	8-18	16-20	5.6-6.5	0
	18-33	15-22	5.1-6.0	0
	33-48	1.8-7.1	5.6-6.5	0
	48-80	1.8-7.1	5.6-6.5	0
184:				
Klinger--------------	0-8	22-26	5.1-7.3	0
	8-14	21-25	5.1-7.3	0
	14-19	22-25	5.1-7.3	0
	19-29	22-28	5.1-6.5	0
	29-59	14-22	5.1-7.8	0-15
	59-79	14-22	5.1-7.8	0-15
198B:				
Floyd----------------	0-8	18-24	6.1-7.3	0
	8-24	17-24	6.1-7.3	0
	24-33	15-20	6.1-7.3	0
	33-41	5.5-20	6.6-7.3	0
	41-50	13-24	6.6-8.4	0-25
	50-80	13-23	6.6-8.4	0-25
221:				
Klossner-------------	0-10	102-191	5.1-7.4	0
	10-26	102-191	5.1-7.4	0
	26-36	27-51	5.6-7.4	0
	36-48	27-51	5.6-7.4	0
	48-65	2.0-24	6.1-7.8	0-15
	65-80	2.0-24	6.1-7.8	0-15

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate
	In	meq/100 g	pH	Pct
284B:				
Flagler--------------	0-8	11-16	5.6-7.3	0
	8-15	10-16	5.6-7.3	0
	15-22	10-16	5.6-7.3	0
	22-33	7.6-13	5.1-6.5	0
	33-65	1.8-7.1	5.1-7.3	0
285:				
Burkhardt------------	0-8	5.6-13	5.1-7.3	0
	8-17	5.6-13	5.1-7.3	0
	17-19	0.8-4.5	5.6-6.5	0
	19-29	0.8-4.5	5.6-6.5	0
	29-60	0.8-4.5	5.6-6.5	0
285C:				
Burkhardt------------	0-8	5.6-13	5.1-7.3	0
	8-17	5.6-13	5.1-7.3	0
	17-19	0.8-4.5	5.6-6.5	0
	19-29	0.8-4.5	5.6-6.5	0
	29-60	0.8-4.5	5.6-6.5	0
323B:				
Fort Dodge-----------	0-8	17-22	5.6-7.3	0
	8-39	17-22	5.6-7.3	0
	39-58	19-25	6.1-7.3	0
	58-80	1.8-7.3	6.1-8.4	0-25
344D:				
Copaston-------------	0-7	12-25	5.6-7.3	0
	7-11	12-17	5.6-7.3	0
	11-18	10-23	5.6-7.8	0-15
	18-80	---	---	---
344G:				
Copaston-------------	0-7	12-25	5.6-7.3	0
	7-11	12-17	5.6-7.3	0
	11-18	10-23	5.6-7.8	0-15
	18-80	---	---	---
354.				
Aquolls, ponded				
377B:				
Dinsdale-------------	0-8	21-24	5.1-7.3	0
	8-12	21-24	5.1-7.3	0
	12-19	24-27	5.1-7.3	0
	19-34	23-27	5.1-7.3	0
	34-46	14-22	5.6-8.4	0-25
	46-80	14-22	5.6-8.4	0-25
377C:				
Dinsdale-------------	0-8	21-24	5.1-7.3	0
	8-12	21-24	5.1-7.3	0
	12-19	24-27	5.1-7.3	0
	19-34	23-27	5.1-7.3	0
	34-46	14-22	5.6-8.4	0-25
	46-80	14-22	5.6-8.4	0-25

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate
	In	meq/100 g	pH	Pct
382:				
Maxfield------------	0-8	23-30	6.6-7.3	0
	8-19	23-29	6.6-7.3	0
	19-29	20-27	6.1-7.3	0
	29-55	14-27	6.1-7.8	0-15
	55-80	14-27	6.1-7.8	0-15
391B:				
Clyde----------------	0-8	22-28	6.6-7.3	0
	8-17	23-27	6.6-7.3	0
	17-23	22-27	6.6-7.3	0
	23-28	18-25	6.1-7.3	0
	28-41	18-25	6.1-7.3	0
	41-44	8.6-13	6.1-7.3	0
	44-62	14-22	6.6-8.4	0-25
	62-66	14-22	6.6-8.4	0-25
Floyd----------------	0-8	18-24	6.1-7.3	0
	8-24	17-24	6.1-7.3	0
	24-33	15-20	6.1-7.3	0
	33-41	5.5-20	6.6-7.3	0
	41-50	13-24	6.6-8.4	0-25
	50-80	13-23	6.6-8.4	0-25
394B:				
Ostrander-----------	0-8	16-23	5.6-7.3	0
	8-19	16-23	5.6-7.3	0
	19-31	15-22	5.1-7.3	0
	31-45	13-23	6.6-7.8	0-15
	45-79	13-23	6.6-7.8	0-15
394C:				
Ostrander-----------	0-8	16-23	5.6-7.3	0
	8-19	16-23	5.6-7.3	0
	19-31	15-22	5.1-7.3	0
	31-45	13-23	6.6-7.8	0-15
	45-79	13-23	6.6-7.8	0-15
395B:				
Marquis--------------	0-8	16-22	5.6-7.3	0
	8-19	16-22	5.6-7.3	0
	19-24	17-25	5.1-7.3	0
	24-54	14-20	6.6-8.4	0-25
	54-80	14-19	6.6-8.4	0-25
398:				
Tripoli--------------	0-8	24-27	6.6-7.3	0
	8-18	24-27	6.6-7.3	0
	18-24	18-23	6.6-7.8	0-15
	24-38	15-22	6.6-7.8	0-15
	38-66	14-22	7.4-8.4	0-25
399:				
Readlyn--------------	0-8	16-24	5.1-7.3	0
	8-19	16-24	5.1-7.3	0
	19-24	18-23	5.1-6.5	0
	24-46	18-23	6.6-7.8	0-15
	46-79	13-19	6.6-8.4	0-25

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate
	In	meq/100 g	pH	Pct
408B:				
Olin	0-8	11-16	5.6-7.3	0
	8-19	10-16	5.6-7.3	0
	19-31	8.9-15	5.6-7.3	0
	31-53	14-22	5.1-7.8	0-15
	53-80	14-22	6.1-8.4	0-25
471:				
Oran	0-8	14-21	5.1-7.3	0
	8-13	13-20	5.1-7.3	0
	13-18	13-20	5.1-7.3	0
	18-45	15-23	5.1-7.8	0-15
	45-80	14-20	7.4-7.8	0-25
485:				
Spillville, occasionally flooded	0-8	16-22	5.6-7.3	0
	8-54	15-22	5.6-7.3	0
	54-79	12-20	5.6-7.3	0
582B:				
Kasson	0-8	16-21	5.1-7.3	0
	8-11	15-20	5.1-7.3	0
	11-20	14-22	4.5-7.3	0
	20-41	14-22	4.5-7.3	0
	41-53	14-22	4.5-7.3	0
	53-69	14-19	5.1-8.4	0-25
	69-80	14-19	5.1-8.4	0-25
582C:				
Kasson	0-8	16-21	5.1-7.3	0
	8-11	15-20	5.1-7.3	0
	11-20	14-22	4.5-7.3	0
	20-41	14-22	4.5-7.3	0
	41-53	14-22	4.5-7.3	0
	53-69	14-19	5.1-8.4	0-25
	69-80	14-19	5.1-8.4	0-25
585:				
Spillville, occasionally flooded	0-8	16-22	5.6-7.3	0
	8-54	15-22	5.6-7.3	0
	54-80	12-20	5.6-7.3	0
Coland, occasionally flooded	0-8	23-30	6.1-7.3	0
	8-32	23-29	6.1-7.3	0
	32-40	21-29	6.1-7.3	0
	40-44	8.9-23	6.1-7.8	0-15
	44-52	8.9-23	6.1-7.8	0-15
	52-60	8.9-22	6.1-7.8	0-15
620B:				
Port Byron	0-8	8.9-18	5.6-7.3	0
	8-13	8.9-17	5.6-7.3	0
	13-31	11-24	6.1-7.3	0
	31-52	8.9-22	6.1-7.3	0
	52-59	6.2-15	6.1-7.3	0
	59-80	6.2-15	6.1-7.3	0

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate
	In	meq/100 g	pH	Pct
620C2:				
Port Byron-----------	0-8	8.9-18	5.6-7.3	0
	8-31	11-24	6.1-7.3	0
	31-52	8.9-22	6.1-7.3	0
	52-59	6.2-15	6.1-7.3	0
	59-80	6.2-15	6.1-7.3	0
626:				
Hayfield, rarely flooded------------	0-8	16-23	5.6-7.3	0
	8-13	15-22	5.6-7.3	0
	13-29	13-24	5.1-6.0	0
	29-80	0.0-4.6	5.6-7.8	0-15
663B:				
Seaton---------------	0-8	10-19	5.6-7.3	0
	8-15	10-18	5.6-7.3	0
	15-44	10-21	5.1-7.3	0
	44-70	7.6-16	5.1-8.4	0-25
	70-80	7.6-16	5.1-8.4	0-25
663C:				
Seaton---------------	0-8	10-19	5.6-7.3	0
	8-15	10-18	5.6-7.3	0
	15-44	10-21	5.1-7.3	0
	44-70	7.6-16	5.1-8.4	0-25
	70-80	7.6-16	5.1-8.4	0-25
663D2:				
Seaton, moderately eroded--------------	0-8	10-19	5.6-7.3	0
	8-44	10-21	5.1-7.3	0
	44-70	7.6-16	5.1-8.4	0-25
	70-80	7.6-16	5.1-8.4	0-25
663D3:				
Seaton, severely eroded--------------	0-8	9.8-18	5.6-7.3	0
	8-44	10-21	5.1-7.3	0
	44-70	7.6-16	5.1-8.4	0-25
	70-95	7.6-16	5.1-8.4	0-25
663E2:				
Seaton, moderately eroded--------------	0-8	10-19	5.6-7.3	0
	8-44	10-21	5.1-7.3	0
	44-70	7.6-16	5.1-8.4	0-25
	70-80	7.6-16	5.1-8.4	0-25
663G:				
Seaton---------------	0-4	10-19	5.6-7.3	0
	4-9	10-18	5.6-7.3	0
	9-44	10-21	5.1-7.3	0
	44-70	7.6-16	5.1-8.4	0-25
	70-80	7.6-16	5.1-8.4	0-25

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate
	In	meq/100 g	pH	Pct
775:				
Billett--------------	0-8	4.8-13	5.1-7.3	0
	8-13	8.6-15	5.1-6.5	0
	13-28	7.6-15	5.1-6.5	0
	28-41	6.2-15	5.6-7.3	0
	41-47	6.2-15	5.6-7.3	0
	47-52	1.8-6.3	5.1-7.8	0-15
	52-60	1.8-6.3	5.1-7.8	0-15
775B:				
Billett--------------	0-8	4.8-13	5.1-7.3	0
	8-13	8.6-15	5.1-6.5	0
	13-28	7.6-15	5.1-6.5	0
	28-41	6.2-15	5.6-7.3	0
	41-47	6.2-15	5.6-7.3	0
	47-52	1.8-6.3	5.1-7.8	0-15
	52-60	1.8-6.3	5.1-7.8	0-15
775C:				
Billett--------------	0-8	4.8-13	5.1-7.3	0
	8-13	8.6-15	5.1-6.5	0
	13-28	7.6-15	5.1-6.5	0
	28-41	6.2-15	5.6-7.3	0
	41-47	6.2-15	5.6-7.3	0
	47-52	1.8-6.3	5.1-7.8	0-15
	52-60	1.8-6.3	5.1-7.8	0-15
778:				
Sattre, rarely flooded-------------	0-8	16-21	6.1-6.5	0
	8-13	16-20	6.1-6.5	0
	13-17	15-22	5.1-7.3	0
	17-32	15-22	5.1-7.3	0
	32-35	15-22	5.1-7.3	0
	35-60	1.8-7.1	5.1-6.5	0
813B:				
Atkinson-------------	0-8	16-21	5.6-6.5	0
	8-13	16-21	5.6-6.5	0
	13-24	20-26	5.1-6.0	0
	24-45	17-28	5.1-6.0	0
	45-50	26-37	6.6-7.3	0
	50-80	---	---	---
813C:				
Atkinson-------------	0-8	16-21	5.6-6.5	0
	8-13	16-21	5.6-6.5	0
	13-24	20-26	5.1-6.0	0
	24-45	17-28	5.1-6.0	0
	45-50	26-37	6.6-7.3	0
	50-80	---	---	---
814B:				
Rockton--------------	0-8	16-23	5.1-7.3	0
	8-15	16-23	5.1-7.3	0
	15-26	20-27	5.1-6.5	0
	26-31	23-43	5.6-7.3	0
	31-80	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate
	In	meq/100 g	pH	Pct
814C:				
Rockton	0-8	16-23	5.1-7.3	0
	8-15	16-23	5.1-7.3	0
	15-26	20-27	5.1-6.5	0
	26-31	23-43	5.6-7.3	0
	31-80	---	---	---
814D:				
Rockton	0-8	16-23	5.1-7.3	0
	8-15	16-23	5.1-7.3	0
	15-26	20-27	5.1-6.5	0
	26-31	23-43	5.6-7.3	0
	31-80	---	---	---
884:				
Klingmore	0-8	22-26	5.1-7.3	0
	8-19	22-25	5.1-7.3	0
	19-56	20-27	5.1-6.5	0
	56-80	14-22	5.6-8.4	0-25
930:				
Orion, occasionally flooded	0-8	7.3-16	5.6-7.3	0
	8-32	7.3-16	5.6-7.3	0
	32-39	7.6-26	5.6-7.3	0
	39-60	6.2-15	5.6-7.3	0
982:				
Maxmore	0-8	22-30	6.6-7.3	0
	8-20	21-29	6.6-7.3	0
	20-50	20-28	6.1-7.3	0
	50-80	14-22	6.1-7.8	0-25
1152:				
Marshan, rarely flooded	0-8	22-29	5.6-7.3	0
	8-14	21-29	5.6-7.3	0
	14-18	20-29	5.6-7.3	0
	18-23	20-27	5.6-7.3	0
	23-30	15-24	5.6-7.3	0
	30-40	0.0-4.6	6.1-7.3	0
	40-60	0.0-4.6	6.1-7.3	0
1226:				
Lawler, rarely flooded	0-8	16-23	5.6-7.3	0
	8-19	16-23	5.6-7.3	0
	19-38	16-23	5.1-6.5	0
	38-80	0.0-4.6	6.1-7.3	0
1585:				
Spillville, channeled	0-54	16-22	5.6-7.3	0
	54-80	12-20	5.6-7.3	0
Coland, channeled	0-32	23-30	6.1-7.3	0
	32-40	21-29	6.1-7.3	0
	40-44	8.9-23	6.1-7.8	0-15
	44-52	8.9-23	6.1-7.8	0-15
	52-60	8.9-22	6.1-7.8	0-15
Aquolls, ponded.				

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate
	In	meq/100 g	pH	Pct
1586:				
Sigglekov, frequently flooded	0-9	7.0-11	5.6-6.5	0
	9-15	1.0-7.0	5.6-7.3	0
	15-35	1.0-7.0	5.6-7.3	0
	35-80	1.0-7.0	5.6-7.3	0
Fluvaquents, frequently flooded.				
Aquents, ponded.				
4946. Udorthents-Interstate highway				
5010. Pits, sand and gravel				
5030. Pits, limestone quarries				
5040. Udorthents, loamy				
5080. Udorthents, sanitary landfill				
8041:				
Sparta, terrace, rarely flooded	0-8	3.6-10.0	5.1-7.3	0
	8-15	3.3-9.2	5.1-7.3	0
	15-72	0.8-5.8	5.1-6.5	0
	72-80	0.0-3.8	5.1-6.0	0
8041B:				
Sparta, terrace, rarely flooded	0-8	3.6-10.0	5.1-7.3	0
	8-15	3.3-9.2	5.1-7.3	0
	15-72	0.8-5.8	5.1-6.5	0
	72-80	0.0-3.8	5.1-6.0	0
8175B:				
Dickinson, terrace, rarely flooded	0-8	11-16	5.6-7.3	0
	8-18	8.6-16	5.1-6.5	0
	18-30	7.6-15	5.1-6.5	0
	30-36	4.1-8.6	5.1-6.5	0
	36-60	4.1-8.6	5.6-6.5	0
AW. Animal waste lagoon				
SL. Sewage lagoon				
W. Water				

Water Features

The table described in this section gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are *negligible, very low, low, medium, high,* and *very high*.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. The table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall

or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Water Features

(See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
41B:										
Sparta--------------------	A	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
41C:										
Sparta--------------------	A	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
43:										
Bremer--------------------	C	Low								
			January	2.0-3.5	>6.0	---	---	None	---	None
			February	1.5-3.0	>6.0	---	---	None	Brief	Rare
			March	0.5-2.0	>6.0	---	---	None	Brief	Rare
			April	0.0-1.0	>6.0	---	---	None	Brief	Rare
			May	0.5-1.5	>6.0	---	---	None	Brief	Rare
			June	1.0-2.0	>6.0	---	---	None	Brief	Rare
			July	2.0-3.0	>6.0	---	---	None	Brief	Rare
			August	2.5-3.5	>6.0	---	---	None	Brief	Rare
			September	3.0-4.0	>6.0	---	---	None	Brief	Rare
			October	2.5-3.5	>6.0	---	---	None	Brief	Rare
			November	1.5-3.0	>6.0	---	---	None	Brief	Rare
			December	2.0-3.5	>6.0	---	---	None	---	None
50B:										
Coloma--------------------	A	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	Brief	Rare
			March	---	---	---	---	None	Brief	Rare
			April	---	---	---	---	None	Brief	Rare
			May	---	---	---	---	None	Brief	Rare
			June	---	---	---	---	None	Brief	Rare
			July	---	---	---	---	None	Brief	Rare
			August	---	---	---	---	None	Brief	Rare
			September	---	---	---	---	None	Brief	Rare
			October	---	---	---	---	None	Brief	Rare
			November	---	---	---	---	None	Brief	Rare
			December	---	---	---	---	None	---	None
63B:										
Chelsea-------------------	A	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
63C:										
Chelsea-------------------	A	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
63E:										
Chelsea-------------------	A	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
83B:										
Kenyon--------------------	B	Low								
			January	6.0-6.7	>6.0	---	---	None	---	None
			February	5.5-6.7	>6.0	---	---	None	---	None
			March	4.5-6.5	>6.0	---	---	None	---	None
			April	4.0-6.0	>6.0	---	---	None	---	None
			May	4.5-6.5	>6.0	---	---	None	---	None
			June	5.0-6.7	>6.0	---	---	None	---	None
			July	6.0-6.7	>6.0	---	---	None	---	None
			August	6.5-6.7	>6.0	---	---	None	---	None
			September	6.5-6.7	>6.0	---	---	None	---	None
			October	6.5-6.7	>6.0	---	---	None	---	None
			November	5.5-6.7	>6.0	---	---	None	---	None
			December	6.0-6.7	>6.0	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
83C:										
Kenyon--------------------	B	Medium								
			January	6.0-6.7	>6.0	---	---	None	---	None
			February	5.5-6.7	>6.0	---	---	None	---	None
			March	4.5-6.5	>6.0	---	---	None	---	None
			April	4.0-6.0	>6.0	---	---	None	---	None
			May	4.5-6.5	>6.0	---	---	None	---	None
			June	5.0-6.7	>6.0	---	---	None	---	None
			July	6.0-6.7	>6.0	---	---	None	---	None
			August	6.5-6.7	>6.0	---	---	None	---	None
			September	6.5-6.7	>6.0	---	---	None	---	None
			October	6.5-6.7	>6.0	---	---	None	---	None
			November	5.5-6.7	>6.0	---	---	None	---	None
			December	6.0-6.7	>6.0	---	---	None	---	None
84:										
Clyde---------------------	B/D	Low								
			January	2.0-3.5	>6.0	---	---	None	---	None
			February	1.5-3.0	>6.0	---	---	None	---	None
			March	0.5-2.0	>6.0	---	---	None	---	None
			April	0.0-1.0	>6.0	---	---	None	---	None
			May	0.5-1.5	>6.0	---	---	None	---	None
			June	1.0-2.0	>6.0	---	---	None	---	None
			July	2.0-3.0	>6.0	---	---	None	---	None
			August	2.5-3.5	>6.0	---	---	None	---	None
			September	3.0-4.0	>6.0	---	---	None	---	None
			October	2.5-3.5	>6.0	---	---	None	---	None
			November	1.5-3.0	>6.0	---	---	None	---	None
			December	2.0-3.5	>6.0	---	---	None	---	None
109B:										
Backbone------------------	B	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
109C:										
Backbone------------------	B	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
109D:										
Backbone------------------	B	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
127:										
Plano, rarely flooded-----	B	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	Brief	Rare
			March	---	---	---	---	None	Brief	Rare
			April	---	---	---	---	None	Brief	Rare
			May	---	---	---	---	None	Brief	Rare
			June	---	---	---	---	None	Brief	Rare
			July	---	---	---	---	None	Brief	Rare
			August	---	---	---	---	None	Brief	Rare
			September	---	---	---	---	None	Brief	Rare
			October	---	---	---	---	None	Brief	Rare
			November	---	---	---	---	None	Brief	Rare
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
135:										
Coland, occasionally flooded------------------	B/D	Low								
			January	2.0-3.5	>6.0	---	---	None	---	None
			February	1.5-3.0	>6.0	---	---	None	Brief	Occasional
			March	0.5-2.0	>6.0	---	---	None	Brief	Occasional
			April	0.0-1.0	>6.0	---	---	None	Brief	Occasional
			May	0.5-1.5	>6.0	---	---	None	Brief	Occasional
			June	1.0-2.0	>6.0	---	---	None	Brief	Occasional
			July	2.0-3.0	>6.0	---	---	None	Brief	Occasional
			August	2.5-3.5	>6.0	---	---	None	Brief	Occasional
			September	3.0-4.0	>6.0	---	---	None	Brief	Occasional
			October	2.5-3.5	>6.0	---	---	None	Brief	Occasional
			November	1.5-3.0	>6.0	---	---	None	Brief	Occasional
			December	2.0-3.5	>6.0	---	---	None	---	None
153:										
Shandep, ponded, occasionally flooded-----	B/D	Low								
			January	2.0-3.5	>6.0	---	---	None	---	None
			February	1.5-3.0	>6.0	0.0-1.0	Long	Frequent	Brief	Occasional
			March	0.5-2.0	>6.0	0.0-1.0	Long	Frequent	Brief	Occasional
			April	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	Brief	Occasional
			May	0.5-2.0	>6.0	0.0-1.0	Long	Frequent	Brief	Occasional
			June	1.0-2.0	>6.0	0.0-1.0	Long	Frequent	Brief	Occasional
			July	2.0-3.5	>6.0	0.0-1.0	Long	Frequent	Brief	Occasional
			August	2.5-3.5	>6.0	0.0-1.0	Long	Frequent	Brief	Occasional
			September	3.0-4.0	>6.0	0.0-1.0	Long	Frequent	Brief	Occasional
			October	2.5-3.5	>6.0	0.0-1.0	Long	Frequent	Brief	Occasional
			November	1.5-3.0	>6.0	0.0-1.0	Long	Frequent	Brief	Occasional
			December	2.0-3.5	>6.0	---	---	None	---	None
173:										
Hoopeston, rarely flooded	B	Low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	Brief	Rare
			March	1.5-4.0	>6.0	---	---	None	Brief	Rare
			April	1.0-3.5	>6.0	---	---	None	Brief	Rare
			May	1.5-4.0	>6.0	---	---	None	Brief	Rare
			June	2.0-4.5	>6.0	---	---	None	Brief	Rare
			July	3.0-5.5	>6.0	---	---	None	Brief	Rare
			August	3.5-6.0	>6.0	---	---	None	Brief	Rare
			September	4.0-6.5	>6.0	---	---	None	Brief	Rare
			October	3.5-6.0	>6.0	---	---	None	Brief	Rare
			November	2.5-5.0	>6.0	---	---	None	Brief	Rare
			December	3.0-5.5	>6.0	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
175B:										
Dickinson	A	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
175C:										
Dickinson	A	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
178:										
Waukee, rarely flooded	B	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	Brief	Rare
			March	---	---	---	---	None	Brief	Rare
			April	---	---	---	---	None	Brief	Rare
			May	---	---	---	---	None	Brief	Rare
			June	---	---	---	---	None	Brief	Rare
			July	---	---	---	---	None	Brief	Rare
			August	---	---	---	---	None	Brief	Rare
			September	---	---	---	---	None	Brief	Rare
			October	---	---	---	---	None	Brief	Rare
			November	---	---	---	---	None	Brief	Rare
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
178B:										
Waukee, rarely flooded----	B	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	Brief	Rare
			March	---	---	---	---	None	Brief	Rare
			April	---	---	---	---	None	Brief	Rare
			May	---	---	---	---	None	Brief	Rare
			June	---	---	---	---	None	Brief	Rare
			July	---	---	---	---	None	Brief	Rare
			August	---	---	---	---	None	Brief	Rare
			September	---	---	---	---	None	Brief	Rare
			October	---	---	---	---	None	Brief	Rare
			November	---	---	---	---	None	Brief	Rare
			December	---	---	---	---	None	---	None
178C:										
Waukee, rarely flooded----	B	Medium								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	Brief	Rare
			March	---	---	---	---	None	Brief	Rare
			April	---	---	---	---	None	Brief	Rare
			May	---	---	---	---	None	Brief	Rare
			June	---	---	---	---	None	Brief	Rare
			July	---	---	---	---	None	Brief	Rare
			August	---	---	---	---	None	Brief	Rare
			September	---	---	---	---	None	Brief	Rare
			October	---	---	---	---	None	Brief	Rare
			November	---	---	---	---	None	Brief	Rare
			December	---	---	---	---	None	---	None
184:										
Klinger-------------------	B	Low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	---	None
			March	1.5-4.0	>6.0	---	---	None	---	None
			April	1.0-3.5	>6.0	---	---	None	---	None
			May	1.5-4.0	>6.0	---	---	None	---	None
			June	2.0-4.5	>6.0	---	---	None	---	None
			July	3.0-5.5	>6.0	---	---	None	---	None
			August	3.5-6.0	>6.0	---	---	None	---	None
			September	4.0-6.5	>6.0	---	---	None	---	None
			October	3.5-6.0	>6.0	---	---	None	---	None
			November	2.5-5.0	>6.0	---	---	None	---	None
			December	3.0-5.5	>6.0	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
198B:										
Floyd	B	Low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	---	None
			March	1.5-4.0	>6.0	---	---	None	---	None
			April	1.0-3.5	>6.0	---	---	None	---	None
			May	1.5-4.0	>6.0	---	---	None	---	None
			June	2.0-4.5	>6.0	---	---	None	---	None
			July	3.0-5.5	>6.0	---	---	None	---	None
			August	3.5-6.0	>6.0	---	---	None	---	None
			September	4.0-6.5	>6.0	---	---	None	---	None
			October	3.5-6.0	>6.0	---	---	None	---	None
			November	2.5-5.0	>6.0	---	---	None	---	None
			December	3.0-5.5	>6.0	---	---	None	---	None
221:										
Klossner	A/D	Very low								
			January	0.0	>6.0	---	---	None	---	None
			February	0.0	>6.0	---	---	None	---	None
			March	0.0	>6.0	---	---	None	---	None
			April	0.0	>6.0	---	---	None	---	None
			May	0.0	>6.0	---	---	None	---	None
			June	0.0	>6.0	---	---	None	---	None
			July	0.0	>6.0	---	---	None	---	None
			August	0.0	>6.0	---	---	None	---	None
			September	0.0	>6.0	---	---	None	---	None
			October	0.0	>6.0	---	---	None	---	None
			November	0.0	>6.0	---	---	None	---	None
			December	0.0	>6.0	---	---	None	---	None
284B:										
Flagler	A	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	Brief	Rare
			March	---	---	---	---	None	Brief	Rare
			April	---	---	---	---	None	Brief	Rare
			May	---	---	---	---	None	Brief	Rare
			June	---	---	---	---	None	Brief	Rare
			July	---	---	---	---	None	Brief	Rare
			August	---	---	---	---	None	Brief	Rare
			September	---	---	---	---	None	Brief	Rare
			October	---	---	---	---	None	Brief	Rare
			November	---	---	---	---	None	Brief	Rare
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
285:										
Burkhardt-----------------	A	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	Brief	Rare
			March	---	---	---	---	None	Brief	Rare
			April	---	---	---	---	None	Brief	Rare
			May	---	---	---	---	None	Brief	Rare
			June	---	---	---	---	None	Brief	Rare
			July	---	---	---	---	None	Brief	Rare
			August	---	---	---	---	None	Brief	Rare
			September	---	---	---	---	None	Brief	Rare
			October	---	---	---	---	None	Brief	Rare
			November	---	---	---	---	None	Brief	Rare
			December	---	---	---	---	None	---	None
285C:										
Burkhardt-----------------	A	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	Brief	Rare
			March	---	---	---	---	None	Brief	Rare
			April	---	---	---	---	None	Brief	Rare
			May	---	---	---	---	None	Brief	Rare
			June	---	---	---	---	None	Brief	Rare
			July	---	---	---	---	None	Brief	Rare
			August	---	---	---	---	None	Brief	Rare
			September	---	---	---	---	None	Brief	Rare
			October	---	---	---	---	None	Brief	Rare
			November	---	---	---	---	None	Brief	Rare
			December	---	---	---	---	None	---	None
323B:										
Fort Dodge----------------	B	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
344D:										
Copaston------------------	D	Medium								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
344G:										
Copaston------------------	D	High								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
354:										
Aquolls, ponded-----------	A/D	Negligible								
			January	0.0	>6.0	0.7-1.3	Very long	Frequent	---	None
			February	0.0	>6.0	0.7-1.3	Very long	Frequent	---	None
			March	0.0	>6.0	1.2-1.8	Very long	Frequent	---	None
			April	0.0	>6.0	1.7-2.3	Very long	Frequent	---	None
			May	0.0	>6.0	1.7-2.3	Very long	Frequent	---	None
			June	0.0	>6.0	1.2-1.8	Very long	Frequent	---	None
			July	0.0	>6.0	0.7-1.3	Very long	Frequent	---	None
			August	0.0	>6.0	0.2-0.8	Very long	Frequent	---	None
			September	0.0	>6.0	0.2-0.8	Very long	Frequent	---	None
			October	0.0	>6.0	0.2-0.8	Very long	Frequent	---	None
			November	0.0	>6.0	0.7-1.3	Very long	Frequent	---	None
			December	0.0	>6.0	0.7-1.3	Very long	Frequent	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
377B:										
Dinsdale------------------	B	Low								
			January	6.0-6.7	>6.0	---	---	None	---	None
			February	5.5-6.7	>6.0	---	---	None	---	None
			March	4.5-6.5	>6.0	---	---	None	---	None
			April	4.0-6.0	>6.0	---	---	None	---	None
			May	4.5-6.5	>6.0	---	---	None	---	None
			June	5.0-6.7	>6.0	---	---	None	---	None
			July	6.0-6.7	>6.0	---	---	None	---	None
			August	6.5-6.7	>6.0	---	---	None	---	None
			September	6.5-6.7	>6.0	---	---	None	---	None
			October	6.5-6.7	>6.0	---	---	None	---	None
			November	5.5-6.7	>6.0	---	---	None	---	None
			December	6.0-6.7	>6.0	---	---	None	---	None
377C:										
Dinsdale------------------	B	Medium								
			January	6.0-6.7	>6.0	---	---	None	---	None
			February	5.5-6.7	>6.0	---	---	None	---	None
			March	4.5-6.5	>6.0	---	---	None	---	None
			April	4.0-6.0	>6.0	---	---	None	---	None
			May	4.5-6.5	>6.0	---	---	None	---	None
			June	5.0-6.7	>6.0	---	---	None	---	None
			July	6.0-6.7	>6.0	---	---	None	---	None
			August	6.5-6.7	>6.0	---	---	None	---	None
			September	6.5-6.7	>6.0	---	---	None	---	None
			October	6.5-6.7	>6.0	---	---	None	---	None
			November	5.5-6.7	>6.0	---	---	None	---	None
			December	6.0-6.7	>6.0	---	---	None	---	None
382:										
Maxfield------------------	B/D	Low								
			January	2.0-3.5	>6.0	---	---	None	---	None
			February	1.5-3.0	>6.0	---	---	None	---	None
			March	0.5-2.0	>6.0	---	---	None	---	None
			April	0.0-1.0	>6.0	---	---	None	---	None
			May	0.5-1.5	>6.0	---	---	None	---	None
			June	1.0-2.0	>6.0	---	---	None	---	None
			July	2.0-3.0	>6.0	---	---	None	---	None
			August	2.5-3.5	>6.0	---	---	None	---	None
			September	3.0-4.0	>6.0	---	---	None	---	None
			October	2.5-3.5	>6.0	---	---	None	---	None
			November	1.5-3.0	>6.0	---	---	None	---	None
			December	2.0-3.5	>6.0	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
391B:										
Clyde	B/D	Low								
			January	2.0-3.5	>6.0	---	---	None	---	None
			February	1.5-3.0	>6.0	---	---	None	---	None
			March	0.5-2.0	>6.0	---	---	None	---	None
			April	0.0-1.0	>6.0	---	---	None	---	None
			May	0.5-1.5	>6.0	---	---	None	---	None
			June	1.0-2.0	>6.0	---	---	None	---	None
			July	2.0-3.0	>6.0	---	---	None	---	None
			August	2.5-3.5	>6.0	---	---	None	---	None
			September	3.0-4.0	>6.0	---	---	None	---	None
			October	2.5-3.5	>6.0	---	---	None	---	None
			November	1.5-3.0	>6.0	---	---	None	---	None
			December	2.0-3.5	>6.0	---	---	None	---	None
Floyd	B	Low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	---	None
			March	1.5-4.0	>6.0	---	---	None	---	None
			April	1.0-3.5	>6.0	---	---	None	---	None
			May	1.5-4.0	>6.0	---	---	None	---	None
			June	2.0-4.5	>6.0	---	---	None	---	None
			July	3.0-5.5	>6.0	---	---	None	---	None
			August	3.5-6.0	>6.0	---	---	None	---	None
			September	4.0-6.5	>6.0	---	---	None	---	None
			October	3.5-6.0	>6.0	---	---	None	---	None
			November	2.5-5.0	>6.0	---	---	None	---	None
			December	3.0-5.5	>6.0	---	---	None	---	None
394B:										
Ostrander	B	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
394C:										
Ostrander	B	Medium								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
395B:										
Marquis	B	Low								
			January	4.0-6.0	>6.0	---	---	None	---	None
			February	3.5-5.5	>6.0	---	---	None	---	None
			March	2.5-4.5	>6.0	---	---	None	---	None
			April	2.0-4.0	>6.0	---	---	None	---	None
			May	2.5-4.5	>6.0	---	---	None	---	None
			June	3.0-5.0	>6.0	---	---	None	---	None
			July	4.0-6.0	>6.0	---	---	None	---	None
			August	4.5-6.5	>6.0	---	---	None	---	None
			September	5.0-6.7	>6.0	---	---	None	---	None
			October	4.5-6.5	>6.0	---	---	None	---	None
			November	3.5-5.5	>6.0	---	---	None	---	None
			December	4.0-6.0	>6.0	---	---	None	---	None
398:										
Tripoli	B/D	Low								
			January	2.0-3.5	>6.0	---	---	None	---	None
			February	1.5-3.0	>6.0	---	---	None	---	None
			March	0.5-2.0	>6.0	---	---	None	---	None
			April	0.0-1.0	>6.0	---	---	None	---	None
			May	0.5-1.5	>6.0	---	---	None	---	None
			June	1.0-2.0	>6.0	---	---	None	---	None
			July	2.0-3.0	>6.0	---	---	None	---	None
			August	2.5-3.5	>6.0	---	---	None	---	None
			September	3.0-4.0	>6.0	---	---	None	---	None
			October	2.5-3.5	>6.0	---	---	None	---	None
			November	1.5-3.0	>6.0	---	---	None	---	None
			December	2.0-3.5	>6.0	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
399:										
Readlyn	B	Low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	---	None
			March	1.5-4.0	>6.0	---	---	None	---	None
			April	1.0-3.5	>6.0	---	---	None	---	None
			May	1.5-4.0	>6.0	---	---	None	---	None
			June	3.0-5.5	>6.0	---	---	None	---	None
			July	3.0-5.5	>6.0	---	---	None	---	None
			August	3.5-6.0	>6.0	---	---	None	---	None
			September	4.0-6.5	>6.0	---	---	None	---	None
			October	3.5-6.0	>6.0	---	---	None	---	None
			November	2.5-5.0	>6.0	---	---	None	---	None
			December	3.0-5.5	>6.0	---	---	None	---	None
408B:										
Olin	B	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
471:										
Oran	B	Low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	---	None
			March	1.5-4.0	>6.0	---	---	None	---	None
			April	1.0-3.5	>6.0	---	---	None	---	None
			May	1.5-4.0	>6.0	---	---	None	---	None
			June	2.0-4.5	>6.0	---	---	None	---	None
			July	3.0-5.5	>6.0	---	---	None	---	None
			August	3.5-6.0	>6.0	---	---	None	---	None
			September	4.0-6.5	>6.0	---	---	None	---	None
			October	3.5-6.0	>6.0	---	---	None	---	None
			November	2.5-5.0	>6.0	---	---	None	---	None
			December	3.0-5.5	>6.0	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
485:										
Spillville, occasionally flooded	B	Low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	Brief	Occasional
			March	1.5-4.0	>6.0	---	---	None	Brief	Occasional
			April	1.0-3.5	>6.0	---	---	None	Brief	Occasional
			May	1.5-4.0	>6.0	---	---	None	Brief	Occasional
			June	2.0-4.5	>6.0	---	---	None	Brief	Occasional
			July	3.0-5.5	>6.0	---	---	None	Brief	Occasional
			August	3.5-6.0	>6.0	---	---	None	Brief	Occasional
			September	4.0-6.5	>6.0	---	---	None	Brief	Occasional
			October	3.5-6.0	>6.0	---	---	None	Brief	Occasional
			November	2.5-5.0	>6.0	---	---	None	Brief	Occasional
			December	3.0-5.5	>6.0	---	---	None	---	None
582B:										
Kasson	D	Low								
			January	4.0-6.0	>6.0	---	---	None	---	None
			February	3.5-5.5	>6.0	---	---	None	---	None
			March	2.5-4.5	>6.0	---	---	None	---	None
			April	2.0-4.0	>6.0	---	---	None	---	None
			May	2.5-4.5	>6.0	---	---	None	---	None
			June	3.0-5.0	>6.0	---	---	None	---	None
			July	4.0-6.0	>6.0	---	---	None	---	None
			August	4.5-6.5	>6.0	---	---	None	---	None
			September	5.0-6.7	>6.0	---	---	None	---	None
			October	4.5-6.5	>6.0	---	---	None	---	None
			November	3.5-5.5	>6.0	---	---	None	---	None
			December	4.0-6.0	>6.0	---	---	None	---	None
582C:										
Kasson	D	Medium								
			January	4.0-6.0	>6.0	---	---	None	---	None
			February	3.5-5.5	>6.0	---	---	None	---	None
			March	2.5-4.5	>6.0	---	---	None	---	None
			April	2.0-4.0	>6.0	---	---	None	---	None
			May	2.5-4.5	>6.0	---	---	None	---	None
			June	3.0-5.0	>6.0	---	---	None	---	None
			July	4.0-6.0	>6.0	---	---	None	---	None
			August	4.5-6.5	>6.0	---	---	None	---	None
			September	5.0-6.7	>6.0	---	---	None	---	None
			October	4.5-6.5	>6.0	---	---	None	---	None
			November	3.5-5.5	>6.0	---	---	None	---	None
			December	4.0-6.0	>6.0	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
585:										
Spillville, occasionally flooded------------------	B	Low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	Brief	Occasional
			March	1.5-4.0	>6.0	---	---	None	Brief	Occasional
			April	1.0-3.5	>6.0	---	---	None	Brief	Occasional
			May	1.5-4.0	>6.0	---	---	None	Brief	Occasional
			June	2.0-4.5	>6.0	---	---	None	Brief	Occasional
			July	3.0-5.5	>6.0	---	---	None	Brief	Occasional
			August	3.5-6.0	>6.0	---	---	None	Brief	Occasional
			September	4.0-6.5	>6.0	---	---	None	Brief	Occasional
			October	3.5-6.0	>6.0	---	---	None	Brief	Occasional
			November	2.5-5.0	>6.0	---	---	None	Brief	Occasional
			December	3.0-5.5	>6.0	---	---	None	---	None
Coland, occasionally flooded------------------	B/D	Low								
			January	2.0-3.5	>6.0	---	---	None	---	None
			February	1.5-3.0	>6.0	---	---	None	Brief	Occasional
			March	0.5-2.0	>6.0	---	---	None	Brief	Occasional
			April	0.0-1.0	>6.0	---	---	None	Brief	Occasional
			May	0.5-1.5	>6.0	---	---	None	Brief	Occasional
			June	1.0-2.0	>6.0	---	---	None	Brief	Occasional
			July	2.0-3.0	>6.0	---	---	None	Brief	Occasional
			August	2.5-3.5	>6.0	---	---	None	Brief	Occasional
			September	3.0-4.0	>6.0	---	---	None	Brief	Occasional
			October	2.5-3.5	>6.0	---	---	None	Brief	Occasional
			November	1.5-3.0	>6.0	---	---	None	Brief	Occasional
			December	2.0-3.5	>6.0	---	---	None	---	None
620B:										
Port Byron----------------	B	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
620C2:										
Port Byron	B	Medium								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
626:										
Hayfield, rarely flooded	B	Low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	Brief	Rare
			March	1.5-4.0	>6.0	---	---	None	Brief	Rare
			April	1.0-3.5	>6.0	---	---	None	Brief	Rare
			May	1.5-4.0	>6.0	---	---	None	Brief	Rare
			June	2.0-4.5	>6.0	---	---	None	Brief	Rare
			July	3.0-5.5	>6.0	---	---	None	Brief	Rare
			August	3.5-6.0	>6.0	---	---	None	Brief	Rare
			September	4.0-6.5	>6.0	---	---	None	Brief	Rare
			October	3.5-6.0	>6.0	---	---	None	Brief	Rare
			November	2.5-5.0	>6.0	---	---	None	Brief	Rare
			December	3.0-5.5	>6.0	---	---	None	---	None
663B:										
Seaton	B	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
663C:										
Seaton---------------------	B	Medium								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
663D2:										
Seaton, moderately eroded	B	Medium								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
663D3:										
Seaton, severely eroded---	B	Medium								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
663E2:										
Seaton, moderately eroded	B	Medium								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
663G:										
Seaton--------------------	B	High								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
775:										
Billett-------------------	A	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
775B:										
Billett-------------------	A	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
775C:										
Billett-------------------	A	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
778:										
Sattre, rarely flooded----	B	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	Brief	Rare
			March	---	---	---	---	None	Brief	Rare
			April	---	---	---	---	None	Brief	Rare
			May	---	---	---	---	None	Brief	Rare
			June	---	---	---	---	None	Brief	Rare
			July	---	---	---	---	None	Brief	Rare
			August	---	---	---	---	None	Brief	Rare
			September	---	---	---	---	None	Brief	Rare
			October	---	---	---	---	None	Brief	Rare
			November	---	---	---	---	None	Brief	Rare
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
813B:										
Atkinson	B	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
813C:										
Atkinson	B	Medium								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
814B:										
Rockton	B	Low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
814C:										
Rockton-------------------	B	Medium								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
814D:										
Rockton-------------------	B	Medium								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	---	None
			March	---	---	---	---	None	---	None
			April	---	---	---	---	None	---	None
			May	---	---	---	---	None	---	None
			June	---	---	---	---	None	---	None
			July	---	---	---	---	None	---	None
			August	---	---	---	---	None	---	None
			September	---	---	---	---	None	---	None
			October	---	---	---	---	None	---	None
			November	---	---	---	---	None	---	None
			December	---	---	---	---	None	---	None
884:										
Klingmore-----------------	B	Low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	---	None
			March	1.5-4.0	>6.0	---	---	None	---	None
			April	1.0-3.5	>6.0	---	---	None	---	None
			May	1.5-4.0	>6.0	---	---	None	---	None
			June	2.0-4.5	>6.0	---	---	None	---	None
			July	3.0-5.5	>6.0	---	---	None	---	None
			August	3.5-6.0	>6.0	---	---	None	---	None
			September	4.0-6.5	>6.0	---	---	None	---	None
			October	3.5-6.0	>6.0	---	---	None	---	None
			November	2.5-5.0	>6.0	---	---	None	---	None
			December	3.0-5.5	>6.0	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
930:										
Orion, occasionally flooded	C	Low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	Very brief	Occasional
			March	1.5-4.0	>6.0	---	---	None	Very brief	Occasional
			April	1.0-3.5	>6.0	---	---	None	Very brief	Occasional
			May	1.5-4.0	>6.0	---	---	None	Very brief	Occasional
			June	2.0-4.5	>6.0	---	---	None	Very brief	Occasional
			July	3.0-5.5	>6.0	---	---	None	Very brief	Occasional
			August	3.5-6.0	>6.0	---	---	None	Very brief	Occasional
			September	4.0-6.5	>6.0	---	---	None	Very brief	Occasional
			October	3.5-6.0	>6.0	---	---	None	Very brief	Occasional
			November	2.5-5.0	>6.0	---	---	None	Very brief	Occasional
			December	3.0-5.5	>6.0	---	---	None	---	None
982:										
Maxmore	B/D	Low								
			January	2.0-3.5	>6.0	---	---	None	---	None
			February	1.5-3.0	>6.0	---	---	None	---	None
			March	0.5-2.0	>6.0	---	---	None	---	None
			April	0.0-1.0	>6.0	---	---	None	---	None
			May	0.5-1.5	>6.0	---	---	None	---	None
			June	1.0-2.0	>6.0	---	---	None	---	None
			July	2.0-3.0	>6.0	---	---	None	---	None
			August	2.5-3.5	>6.0	---	---	None	---	None
			September	3.0-4.0	>6.0	---	---	None	---	None
			October	2.5-3.5	>6.0	---	---	None	---	None
			November	1.5-3.0	>6.0	---	---	None	---	None
			December	2.0-3.5	>6.0	---	---	None	---	None
1152:										
Marshan, rarely flooded	B/D	Low								
			January	2.0-3.5	>6.0	---	---	None	---	None
			February	1.5-3.0	>6.0	---	---	None	Brief	Rare
			March	0.5-2.0	>6.0	---	---	None	Brief	Rare
			April	0.0-1.0	>6.0	---	---	None	Brief	Rare
			May	0.5-1.5	>6.0	---	---	None	Brief	Rare
			June	1.0-2.0	>6.0	---	---	None	Brief	Rare
			July	2.0-3.0	>6.0	---	---	None	Brief	Rare
			August	2.5-3.5	>6.0	---	---	None	Brief	Rare
			September	3.0-4.0	>6.0	---	---	None	Brief	Rare
			October	2.5-3.5	>6.0	---	---	None	Brief	Rare
			November	1.5-3.0	>6.0	---	---	None	Brief	Rare
			December	2.0-3.5	>6.0	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
1226:										
Lawler, rarely flooded----	B	Low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	Brief	Rare
			March	1.5-4.0	>6.0	---	---	None	Brief	Rare
			April	1.0-3.5	>6.0	---	---	None	Brief	Rare
			May	1.5-4.0	>6.0	---	---	None	Brief	Rare
			June	2.0-4.5	>6.0	---	---	None	Brief	Rare
			July	3.0-5.5	>6.0	---	---	None	Brief	Rare
			August	3.5-6.0	>6.0	---	---	None	Brief	Rare
			September	4.0-6.5	>6.0	---	---	None	Brief	Rare
			October	3.5-6.0	>6.0	---	---	None	Brief	Rare
			November	2.5-5.0	>6.0	---	---	None	Brief	Rare
			December	3.0-5.5	>6.0	---	---	None	---	None
1585:										
Spillville, channeled-----	B	Low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	Long	Frequent
			March	1.5-4.0	>6.0	---	---	None	Long	Frequent
			April	1.0-3.5	>6.0	---	---	None	Long	Frequent
			May	1.5-4.0	>6.0	---	---	None	Long	Frequent
			June	2.0-4.5	>6.0	---	---	None	Long	Frequent
			July	3.0-5.5	>6.0	---	---	None	Long	Frequent
			August	3.5-6.0	>6.0	---	---	None	Long	Frequent
			September	4.0-6.5	>6.0	---	---	None	Long	Frequent
			October	3.5-6.0	>6.0	---	---	None	Long	Frequent
			November	2.5-5.0	>6.0	---	---	None	Long	Frequent
			December	3.0-5.5	>6.0	---	---	None	---	None
Coland, channeled---------	B/D	Low								
			January	2.0-3.5	>6.0	---	---	None	---	None
			February	1.5-3.0	>6.0	---	---	None	Long	Frequent
			March	0.5-2.0	>6.0	---	---	None	Long	Frequent
			April	0.0-1.0	>6.0	---	---	None	Long	Frequent
			May	0.5-1.5	>6.0	---	---	None	Long	Frequent
			June	1.0-2.0	>6.0	---	---	None	Long	Frequent
			July	2.0-3.0	>6.0	---	---	None	Long	Frequent
			August	2.5-3.5	>6.0	---	---	None	Long	Frequent
			September	3.0-4.0	>6.0	---	---	None	Long	Frequent
			October	2.5-3.5	>6.0	---	---	None	Long	Frequent
			November	1.5-3.0	>6.0	---	---	None	Long	Frequent
			December	2.0-3.5	>6.0	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
1585:										
Aquolls, ponded	A/D	Negligible								
			January	0.0	>6.0	0.7-1.3	Very long	Frequent	---	None
			February	0.0	>6.0	0.7-1.3	Very long	Frequent	Long	Frequent
			March	0.0	>6.0	1.2-1.8	Very long	Frequent	Long	Frequent
			April	0.0	>6.0	1.7-2.3	Very long	Frequent	Long	Frequent
			May	0.0	>6.0	1.7-2.3	Very long	Frequent	Long	Frequent
			June	0.0	>6.0	1.2-1.8	Very long	Frequent	Long	Frequent
			July	0.0	>6.0	0.7-1.3	Very long	Frequent	Long	Frequent
			August	0.0	>6.0	0.2-0.8	Very long	Frequent	Long	Frequent
			September	0.0	>6.0	0.2-0.8	Very long	Frequent	Long	Frequent
			October	0.0	>6.0	0.2-0.8	Very long	Frequent	Long	Frequent
			November	0.0	>6.0	0.7-1.3	Very long	Frequent	Long	Frequent
			December	0.0	>6.0	0.7-1.3	Very long	Frequent	---	None
1586:										
Sigglekov, frequently flooded	A	Very low								
			January	3.0-5.5	>6.0	---	---	None	---	None
			February	2.5-5.0	>6.0	---	---	None	Long	Frequent
			March	1.5-4.0	>6.0	---	---	None	Long	Frequent
			April	1.0-3.5	>6.0	---	---	None	Long	Frequent
			May	1.5-4.0	>6.0	---	---	None	Long	Frequent
			June	2.0-4.5	>6.0	---	---	None	Long	Frequent
			July	3.0-5.5	>6.0	---	---	None	Long	Frequent
			August	3.5-6.0	>6.0	---	---	None	Long	Frequent
			September	4.0-6.5	>6.0	---	---	None	Long	Frequent
			October	3.5-6.0	>6.0	---	---	None	Long	Frequent
			November	2.5-5.0	>6.0	---	---	None	Long	Frequent
			December	3.0-5.5	>6.0	---	---	None	---	None
Fluvaquents, frequently flooded	B	Negligible								
			January	2.0-3.5	>6.0	---	---	None	---	None
			February	1.5-3.0	>6.0	---	---	None	Long	Frequent
			March	0.5-2.0	>6.0	---	---	None	Long	Frequent
			April	0.0-1.0	>6.0	---	---	None	Long	Frequent
			May	0.5-1.5	>6.0	---	---	None	Long	Frequent
			June	1.0-2.0	>6.0	---	---	None	Long	Frequent
			July	2.0-3.0	>6.0	---	---	None	Long	Frequent
			August	2.5-3.5	>6.0	---	---	None	Long	Frequent
			September	3.0-4.0	>6.0	---	---	None	Long	Frequent
			October	2.5-3.5	>6.0	---	---	None	Long	Frequent
			November	1.5-3.0	>6.0	---	---	None	Long	Frequent
			December	2.0-3.5	>6.0	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
1586:										
Aquents, ponded-----------	A/D	Negligible								
			January	0.0	>6.0	0.7-1.3	Very long	Frequent	---	None
			February	0.0	>6.0	0.7-1.3	Very long	Frequent	Long	Frequent
			March	0.0	>6.0	1.2-1.8	Very long	Frequent	Long	Frequent
			April	0.0	>6.0	1.7-2.3	Very long	Frequent	Long	Frequent
			May	0.0	>6.0	1.7-2.3	Very long	Frequent	Long	Frequent
			June	0.0	>6.0	1.2-1.8	Very long	Frequent	Long	Frequent
			July	0.0	>6.0	0.7-1.3	Very long	Frequent	Long	Frequent
			August	0.0	>6.0	0.2-0.8	Very long	Frequent	Long	Frequent
			September	0.0	>6.0	0.2-0.8	Very long	Frequent	Long	Frequent
			October	0.0	>6.0	0.2-0.8	Very long	Frequent	Long	Frequent
			November	0.0	>6.0	0.7-1.3	Very long	Frequent	Long	Frequent
			December	0.0	>6.0	0.7-1.3	Very long	Frequent	---	None
4946.										
Udorthents-Interstate highway										
5010.										
Pits, sand and gravel										
5030.										
Pits, limestone quarries										
5040.										
Udorthents, loamy										
5080.										
Udorthents, sanitary landfill										

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
8041:										
Sparta, terrace, rarely flooded------------------	A	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	Brief	Rare
			March	---	---	---	---	None	Brief	Rare
			April	---	---	---	---	None	Brief	Rare
			May	---	---	---	---	None	Brief	Rare
			June	---	---	---	---	None	Brief	Rare
			July	---	---	---	---	None	Brief	Rare
			August	---	---	---	---	None	Brief	Rare
			September	---	---	---	---	None	Brief	Rare
			October	---	---	---	---	None	Brief	Rare
			November	---	---	---	---	None	Brief	Rare
			December	---	---	---	---	None	---	None
8041B:										
Sparta, terrace, rarely flooded------------------	A	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	Brief	Rare
			March	---	---	---	---	None	Brief	Rare
			April	---	---	---	---	None	Brief	Rare
			May	---	---	---	---	None	Brief	Rare
			June	---	---	---	---	None	Brief	Rare
			July	---	---	---	---	None	Brief	Rare
			August	---	---	---	---	None	Brief	Rare
			September	---	---	---	---	None	Brief	Rare
			October	---	---	---	---	None	Brief	Rare
			November	---	---	---	---	None	Brief	Rare
			December	---	---	---	---	None	---	None

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Surface runoff	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
				Ft	Ft	Ft				
8175B:										
Dickinson, terrace, rarely flooded------------------	A	Very low								
			January	---	---	---	---	None	---	None
			February	---	---	---	---	None	Brief	Rare
			March	---	---	---	---	None	Brief	Rare
			April	---	---	---	---	None	Brief	Rare
			May	---	---	---	---	None	Brief	Rare
			June	---	---	---	---	None	Brief	Rare
			July	---	---	---	---	None	Brief	Rare
			August	---	---	---	---	None	Brief	Rare
			September	---	---	---	---	None	Brief	Rare
			October	---	---	---	---	None	Brief	Rare
			November	---	---	---	---	None	Brief	Rare
			December	---	---	---	---	None	---	None
AW.										
Animal waste lagoon										
SL.										
Sewage lagoon										
W.										
Water										

Soil Features

The table described in this section gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness of the restrictive layer, which significantly affects the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Restrictive layer			Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Hardness	Initial	Total		Uncoated steel	Concrete
		In		In	In			
41B:								
Sparta-----------------	---	---	---	---	---	Low	Low	Moderate
41C:								
Sparta-----------------	---	---	---	---	---	Low	Low	Moderate
43:								
Bremer-----------------	---	---	---	---	---	High	Moderate	Moderate
50B:								
Coloma-----------------	---	---	---	---	---	Low	Low	Moderate
63B:								
Chelsea----------------	---	---	---	---	---	Low	Low	Low
63C:								
Chelsea----------------	---	---	---	---	---	Low	Low	Low
63E:								
Chelsea----------------	---	---	---	---	---	Low	Low	Low
83B:								
Kenyon-----------------	---	---	---	---	---	Moderate	Moderate	Moderate
83C:								
Kenyon-----------------	---	---	---	---	---	Moderate	Moderate	Moderate
84:								
Clyde------------------	---	---	---	---	---	High	High	Low
109B:								
Backbone---------------	Lithic bedrock	20-40	Indurated	---	---	Moderate	Low	Low
109C:								
Backbone---------------	Lithic bedrock	20-40	Indurated	---	---	Moderate	Low	Low
109D:								
Backbone---------------	Lithic bedrock	20-40	Indurated	---	---	Moderate	Low	Low
127:								
Plano, rarely flooded--	---	---	---	---	---	High	Moderate	Moderate

Soil Features--Continued

Map symbol and soil name	Restrictive layer: Kind	Restrictive layer: Depth to top	Restrictive layer: Hardness	Subsidence: Initial	Subsidence: Total	Potential for frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
		In		In	In			
135:								
Coland, occasionally flooded	---	---	---	---	---	High	High	Low
153:								
Shandep, ponded, occasionally flooded	---	---	---	---	---	High	High	Moderate
173:								
Hoopeston, rarely flooded	---	---	---	---	---	High	Low	Moderate
175B:								
Dickinson	---	---	---	---	---	Moderate	Low	Moderate
175C:								
Dickinson	---	---	---	---	---	Moderate	Low	Moderate
178:								
Waukee, rarely flooded	---	---	---	---	---	Low	Low	Moderate
178B:								
Waukee, rarely flooded	---	---	---	---	---	Low	Low	Moderate
178C:								
Waukee, rarely flooded	---	---	---	---	---	Low	Low	Moderate
184:								
Klinger	---	---	---	---	---	High	High	Moderate
198B:								
Floyd	---	---	---	---	---	High	High	Low
221:								
Klossner	---	---	---	4-15	25-32	High	High	Moderate
284B:								
Flagler	---	---	---	---	---	Low	Moderate	Low
285:								
Burkhardt	---	---	---	---	---	Low	Low	High
285C:								
Burkhardt	---	---	---	---	---	Low	Low	High

Soil Features--Continued

Map symbol and soil name	Restrictive layer			Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Hardness	Initial	Total		Uncoated steel	Concrete
		In		In	In			
323B:								
Fort Dodge	---	---	---	---	---	Moderate	Moderate	Low
344D:								
Copaston	Lithic bedrock	10-20	Strongly cemented	---	---	Moderate	Low	Low
344G:								
Copaston	Lithic bedrock	10-20	Strongly cemented	---	---	Moderate	Low	Low
354.								
Aquolls, ponded								
377B:								
Dinsdale	---	---	---	---	---	High	Moderate	Moderate
377C:								
Dinsdale	---	---	---	---	---	High	Moderate	Moderate
382:								
Maxfield	---	---	---	---	---	High	High	Moderate
391B:								
Clyde	---	---	---	---	---	High	High	Low
Floyd	---	---	---	---	---	High	High	Low
394B:								
Ostrander	---	---	---	---	---	Moderate	Moderate	Low
394C:								
Ostrander	---	---	---	---	---	Moderate	Moderate	Low
395B:								
Marquis	---	---	---	---	---	Moderate	Moderate	Moderate
398:								
Tripoli	---	---	---	---	---	High	High	Moderate
399:								
Readlyn	---	---	---	---	---	High	High	Moderate
408B:								
Olin	---	---	---	---	---	Moderate	Moderate	Moderate

Soil Features--Continued

Map symbol and soil name	Restrictive layer: Kind	Restrictive layer: Depth to top	Restrictive layer: Hardness	Subsidence: Initial	Subsidence: Total	Potential for frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
		In		In	In			
471:								
Oran	---	---	---	---	---	High	High	Moderate
485:								
Spillville, occasionally flooded	---	---	---	---	---	Moderate	High	Moderate
582B:								
Kasson	---	---	---	---	---	Moderate	Moderate	Moderate
582C:								
Kasson	---	---	---	---	---	Moderate	Moderate	Moderate
585:								
Spillville, occasionally flooded	---	---	---	---	---	Moderate	High	Moderate
Coland, occasionally flooded	---	---	---	---	---	High	High	Low
620B:								
Port Byron	---	---	---	---	---	High	Low	Moderate
620C2:								
Port Byron	---	---	---	---	---	High	Low	Moderate
626:								
Hayfield, rarely flooded	---	---	---	---	---	High	Low	Moderate
663B:								
Seaton	---	---	---	---	---	High	Low	Moderate
663C:								
Seaton	---	---	---	---	---	High	Low	Moderate
663D2:								
Seaton, moderately eroded	---	---	---	---	---	High	Low	Moderate
663D3:								
Seaton, severely eroded	---	---	---	---	---	High	Low	Moderate

Soil Features--Continued

Map symbol and soil name	Restrictive layer			Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Hardness	Initial	Total		Uncoated steel	Concrete
		In		In	In			
663E2:								
Seaton, moderately eroded	---	---	---	---	---	High	Low	Moderate
663G:								
Seaton	---	---	---	---	---	High	Low	Moderate
775:								
Billett	---	---	---	---	---	Moderate	Low	Moderate
775B:								
Billett	---	---	---	---	---	Moderate	Low	Moderate
775C:								
Billett	---	---	---	---	---	Moderate	Low	Moderate
778:								
Sattre, rarely flooded	---	---	---	---	---	Low	Low	High
813B:								
Atkinson	Lithic bedrock	40-55	Indurated	---	---	Moderate	Moderate	Moderate
813C:								
Atkinson	Lithic bedrock	40-55	Indurated	---	---	Moderate	Moderate	Moderate
814B:								
Rockton	Lithic bedrock	20-40	Indurated	---	---	Moderate	Low	Low
814C:								
Rockton	Lithic bedrock	20-40	Indurated	---	---	Moderate	Low	Low
814D:								
Rockton	Lithic bedrock	20-40	Indurated	---	---	Moderate	Low	Low
884:								
Klingmore	---	---	---	---	---	High	High	Moderate
930:								
Orion, occasionally flooded	---	---	---	---	---	High	High	Low
982:								
Maxmore	---	---	---	---	---	High	High	Moderate

Soil Features--Continued

Map symbol and soil name	Restrictive layer			Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Hardness	Initial	Total		Uncoated steel	Concrete
		In		In	In			
1152:								
Marshan, rarely flooded	---	---	---	---	---	High	High	Moderate
1226:								
Lawler, rarely flooded	---	---	---	---	---	High	High	Moderate
1585:								
Spillville, channeled--	---	---	---	---	---	Moderate	High	Moderate
Coland, channeled------	---	---	---	---	---	High	High	Low
Aquolls, ponded.								
1586:								
Sigglekov, frequently flooded---------------	---	---	---	---	---	Low	Low	Moderate
Fluvaquents, frequently flooded.								
Aquents, ponded.								
4946.								
Udorthents-Interstate highway								
5010.								
Pits, sand and gravel								
5030.								
Pits, limestone quarries								
5040.								
Udorthents, loamy								
5080.								
Udorthents, sanitary landfill								
8041:								
Sparta, terrace, rarely flooded---------------	---	---	---	---	---	Low	Low	Moderate

Soil Features--Continued

Map symbol and soil name	Restrictive layer: Kind	Restrictive layer: Depth to top	Restrictive layer: Hardness	Subsidence: Initial	Subsidence: Total	Potential for frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
		In		In	In			
8041B:								
Sparta, terrace, rarely flooded---------------	---	---	---	---	---	Low	Low	Moderate
8175B:								
Dickinson, terrace, rarely flooded--------	---	---	---	---	---	Moderate	Low	Moderate
AW.								
Animal waste lagoon								
SL.								
Sewage lagoon								
W.								
Water								

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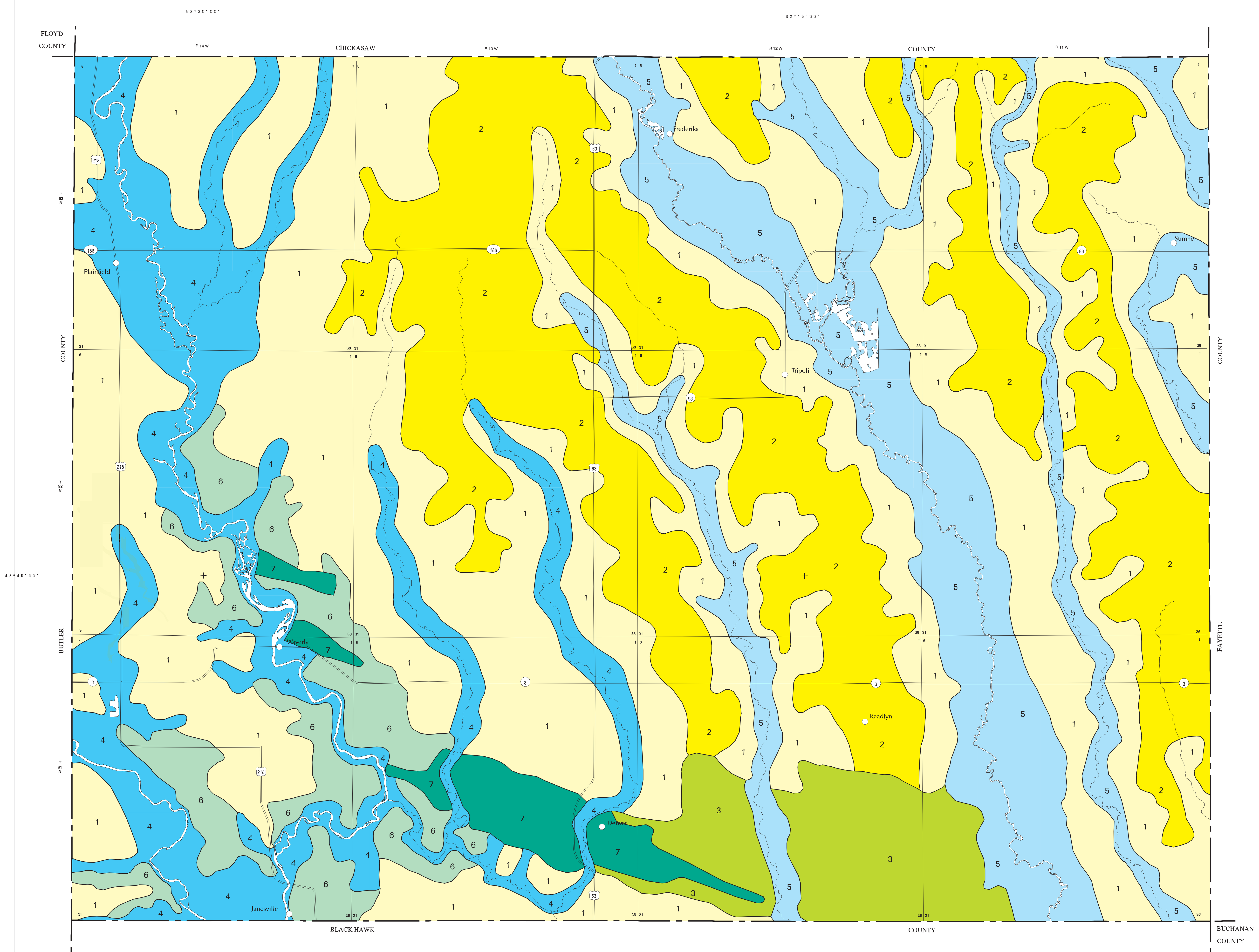


LEGEND

1	Floyd-Clyde-Kenyon association
2	Tripoli-Readlyn association
3	Klinger-Maxfield association
4	Spillville-Waukee-Coland association
5	Marshan-Sigglekov-Hayfield association
6	Sparta-Rockton-Kenyon association
7	Seaton-Port Byron association

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
IOWA AGRICULTURE AND HOME ECONOMICS EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE,
IOWA STATE UNIVERSITY
DIVISION OF SOIL CONSERVATION,
IOWA DEPARTMENT OF AGRICULTURE
AND LAND STEWARDSHIP

GENERAL SOIL MAP
BREMER COUNTY, IOWA

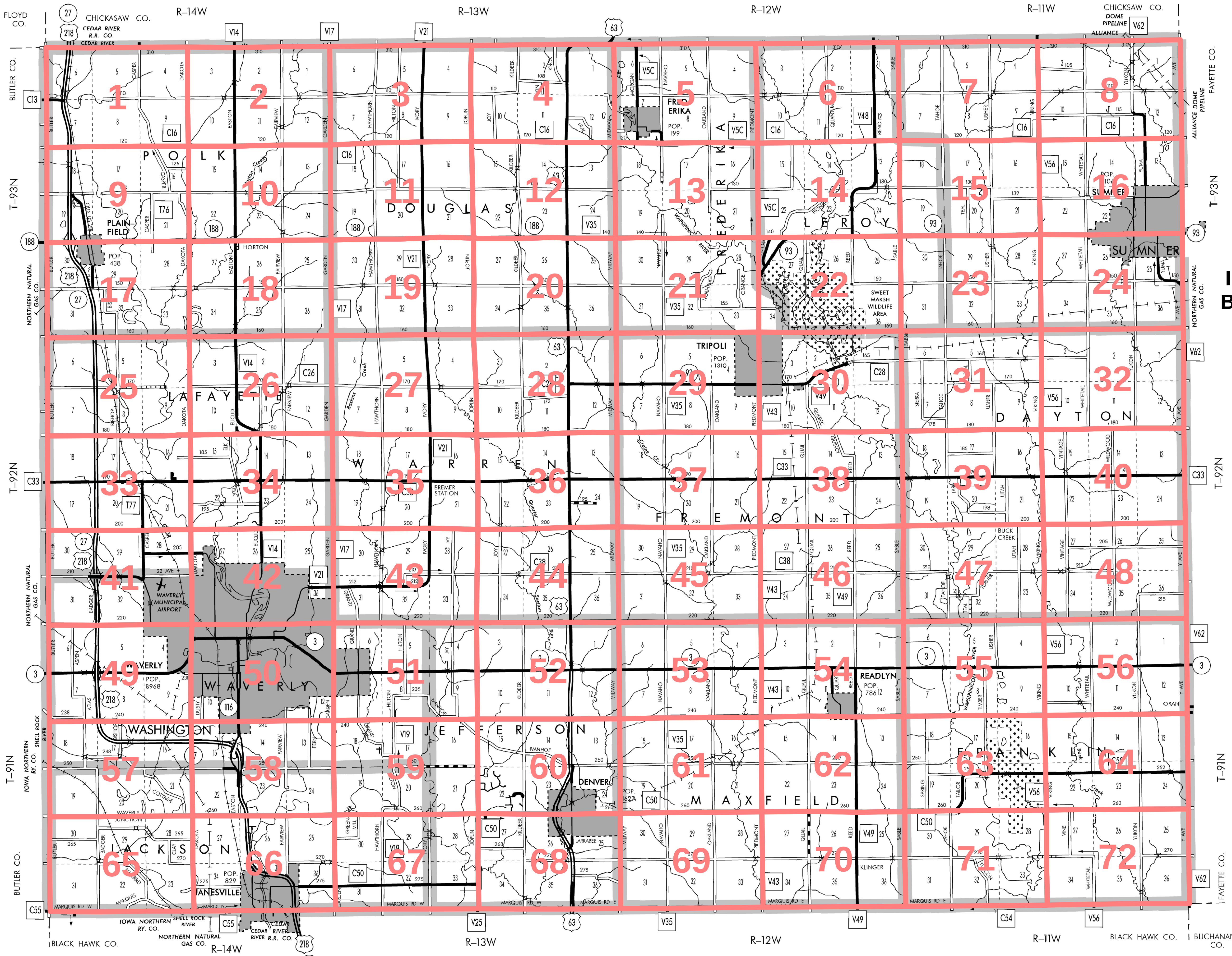
MILES

KILOMETERS

SCALE = 1:80000

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

INDEX TO MAP SHEETS
BREMER COUNTY, IOWA



UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BREMER COUNTY, IOWA

IOWA AGRICULTURE AND HOME ECONOMICS EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE, IOWA STATE UNIVERSITY
DIVISION OF SOIL CONSERVATION, IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP

SOIL LEGEND

Map unit symbols consist of a combination of numbers and letters. The initial numbers represent the kind of soil. A capital letter following those numbers indicates the class of slope. Map unit symbols that do not have a slope class letter are for nearly level soils or for miscellaneous areas. A final number of 2 following the slope class letter indicates that the map unit is predominantly moderately eroded. A final number of 3 indicates that the map unit is predominantly severely eroded.

SYMBOL	NAME
41B	Sparta loamy fine sand, 2 to 5 percent slopes
41C	Sparta loamy fine sand, 5 to 9 percent slopes
43	Bremer silty clay loam, 0 to 2 percent slopes, rarely flooded
50B	Coloma loamy sand, 2 to 5 percent slopes, rarely flooded
63B	Chelsea loamy fine sand, 2 to 5 percent slopes
63C	Chelsea loamy fine sand, 5 to 9 percent slopes
63E	Chelsea loamy fine sand, 9 to 18 percent slopes
83B	Kenyon loam, 2 to 5 percent slopes
83C	Kenyon loam, 5 to 9 percent slopes
84	Clyde silty clay loam, 0 to 3 percent slopes
109B	Backbone sandy loam, 2 to 5 percent slopes
109C	Backbone sandy loam, 5 to 9 percent slopes
109D	Backbone sandy loam, 9 to 14 percent slopes
127	Plano silty clay loam, 0 to 2 percent slopes, rarely flooded
135	Coland clay loam, 0 to 2 percent slopes, occasionally flooded
153	Shandep loam, ponded, 0 to 1 percent slopes, occasionally flooded
173	Hoopeston sandy loam, terrace, 0 to 2 percent slopes, rarely flooded
175B	Dickinson fine sandy loam, 2 to 5 percent slopes
175C	Dickinson fine sandy loam, 5 to 9 percent slopes
178	Waukee loam, 0 to 2 percent slopes, rarely flooded
178B	Waukee loam, 2 to 5 percent slopes, rarely flooded
178C	Waukee loam, 5 to 9 percent slopes, rarely flooded
184	Klinger silty clay loam, 1 to 3 percent slopes
198B	Floyd loam, 1 to 4 percent slopes
221	Klossner muck, 1 to 3 percent slopes
284B	Flagler sandy loam, 1 to 4 percent slopes, rarely flooded
285	Burkhardt sandy loam, 0 to 2 percent slopes, rarely flooded
285C	Burkhardt sandy loam, 2 to 9 percent slopes, rarely flooded
323B	Fort Dodge loam, 1 to 4 percent slopes
344D	Copaston loam, 5 to 14 percent slopes
344G	Copaston loam, 14 to 30 percent slopes
354	Aquolls, ponded, 0 to 1 percent slopes
377B	Dinsdale silty clay loam, 2 to 5 percent slopes
377C	Dinsdale silty clay loam, 5 to 9 percent slopes
382	Maxfield silty clay loam, 0 to 2 percent slopes
391B	Clyde-Floyd complex, 1 to 4 percent slopes
394B	Ostrander loam, 2 to 5 percent slopes
394C	Ostrander loam, 5 to 9 percent slopes
395B	Marquis loam, 2 to 5 percent slopes
398	Tripoli clay loam, 0 to 2 percent slopes
399	Readlyn loam, 1 to 3 percent slopes
408B	Olin fine sandy loam, 2 to 5 percent slopes
471	Oran loam, 1 to 3 percent slopes
485	Spillville loam, 0 to 2 percent slopes, occasionally flooded
582B	Kasson loam, 2 to 5 percent slopes
582C	Kasson loam, 5 to 9 percent slopes
585	Spillville-Coland complex, 0 to 2 percent slopes, occasionally flooded
620B	Port Byron silt loam, 2 to 5 percent slopes
620C2	Port Byron silt loam, 5 to 9 percent slopes, moderately eroded
626	Hayfield loam, 0 to 2 percent slopes, rarely flooded
663B	Seaton silt loam, 2 to 5 percent slopes
663C	Seaton silt loam, 5 to 9 percent slopes
663D2	Seaton silt loam, 9 to 14 percent slopes, moderately eroded
663D3	Seaton silt loam, 9 to 14 percent slopes, severely eroded
663E2	Seaton silt loam, 14 to 18 percent slopes, moderately eroded
663G	Seaton silt loam, 18 to 40 percent slopes
775	Billett sandy loam, 0 to 2 percent slopes
775B	Billett sandy loam, 2 to 5 percent slopes
775C	Billett sandy loam, 5 to 9 percent slopes
778	Sattre loam, 0 to 2 percent slopes, rarely flooded
813B	Atkinson loam, 2 to 5 percent slopes
813C	Atkinson loam, 5 to 9 percent slopes
814B	Rockton loam, 2 to 5 percent slopes
814C	Rockton loam, 5 to 9 percent slopes
814D	Rockton loam, 9 to 14 percent slopes
884	Klingmore silty clay loam, 1 to 3 percent slopes
930	Orion silt loam, 0 to 2 percent slopes, occasionally flooded
982	Maxmore silty clay loam, 0 to 2 percent slopes
1152	Marshan clay loam, 0 to 2 percent slopes, rarely flooded
1226	Lawler loam, 0 to 2 percent slopes, rarely flooded
1585	Spillville, channeled-Coland, channeled-Aquolls, ponded, complex, 0 to 2 percent slopes, frequently flooded
1586	Sigglekov-Fluvaquents, channeled-Aquents, ponded, complex, 0 to 2 percent slopes, frequently flooded
4946	Udorthents-Interstate highway complex, 0 to 5 percent slopes
5010	Pits, sand and gravel
5030	Pits, limestone quarries
5040	Udorthents, loamy
5080	Udorthents, sanitary landfill
8041	Sparta loamy sand, terrace, 0 to 2 percent slopes, rarely flooded
8041B	Sparta loamy sand, terrace, 2 to 5 percent slopes, rarely flooded
8175B	Dickinson fine sandy loam, terrace, 1 to 4 percent slopes, rarely flooded
AW	Animal waste lagoon
SL	Sewage lagoon
W	Water

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

SOIL SURVEY FEATURES

SOIL DELINEATIONS AND SYMBOLS — 41B 408B

STANDARD LANDFORM AND MISCELLANEOUS SURFACE FEATURES

- Bedrock escarpment
- Non-bedrock escarpment
- Gravel pit
- Gravelly spot
- Levee
- Marsh or swamp
- Rock outcrop
- Sandy spot
- Severely eroded spot
- Short steep slope
- Sinkhole
- Wet spot

AD HOC FEATURES

- Clay spot, gray
- Calcareous spot
- Glacial till spot
- Organic spot

BOUNDARIES

- County or parish
- Field sheet matchline and neatline
- Public Land Survey System Section Boundary

ROAD EMBLEM & DESIGNATIONS

- Federal — 287
- State — 52

HYDROGRAPHIC FEATURES

DRAINAGE

- Perennial stream

INTERMITTENT

- Crossable with usual farm equipment
- Not crossable with usual farm equipment
- Drainage end (indicates direction of flow)

CANALS OR DITCHES

- Perennial drainage or irrigation

Township 93N Range 14W

Soil Survey of Bremer County, Iowa

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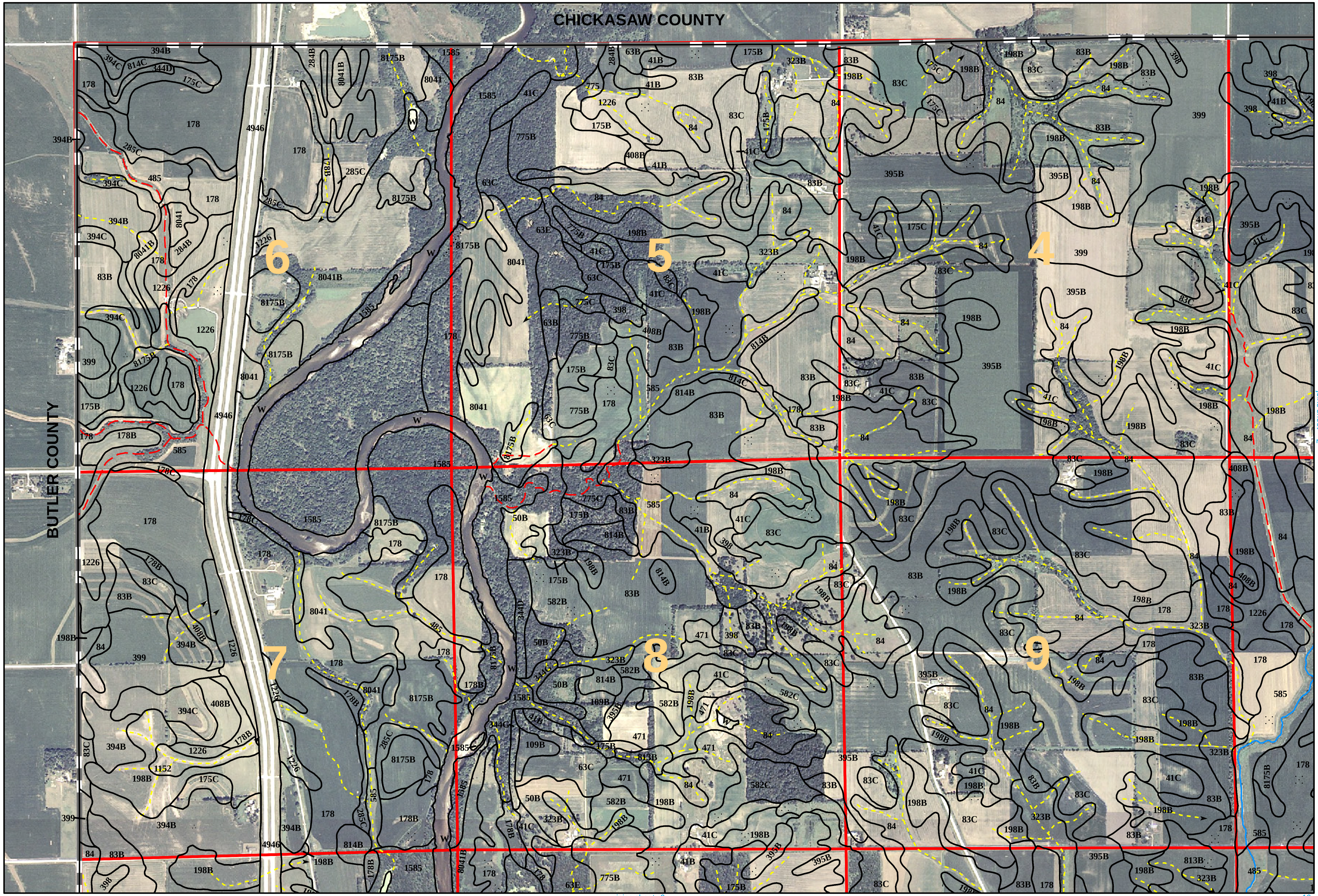

0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

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2

Township 93N Range 14W

2

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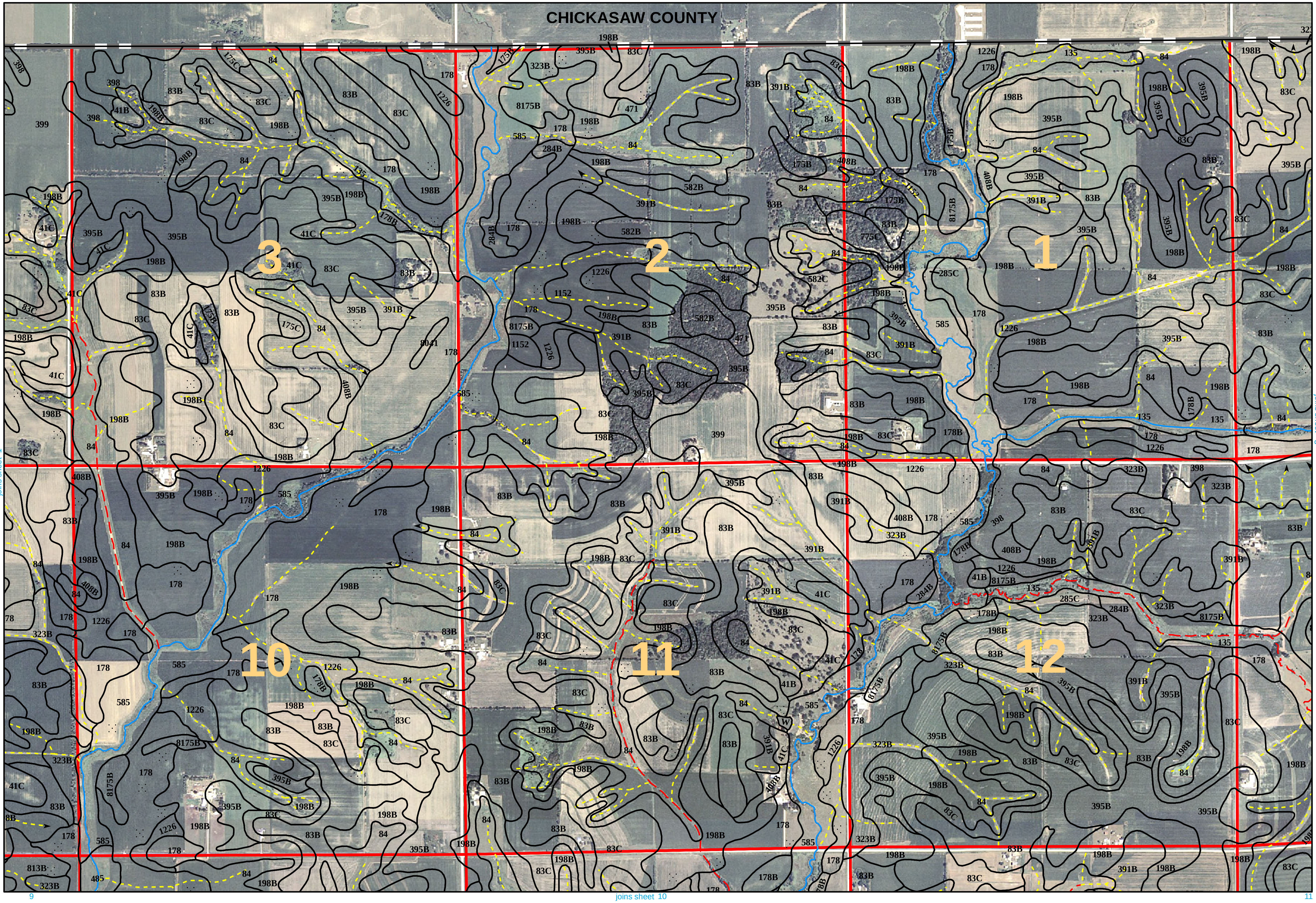

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0 1/4 1/2 3/4 1 Miles

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N

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NRCS Natural Resources Conservation Service

Township 93N Range 13W

3

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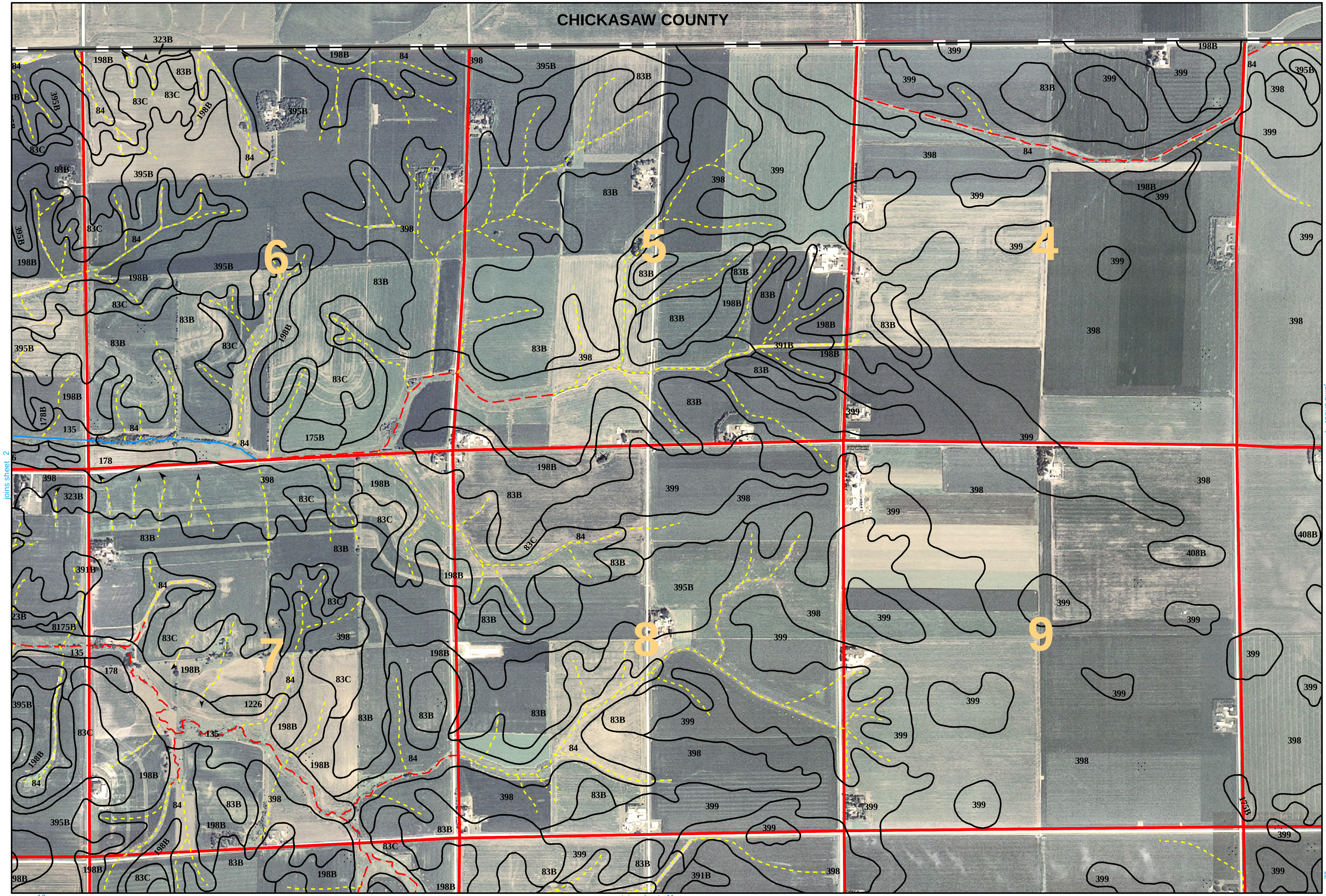

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Township 93N Range 13W

4

4

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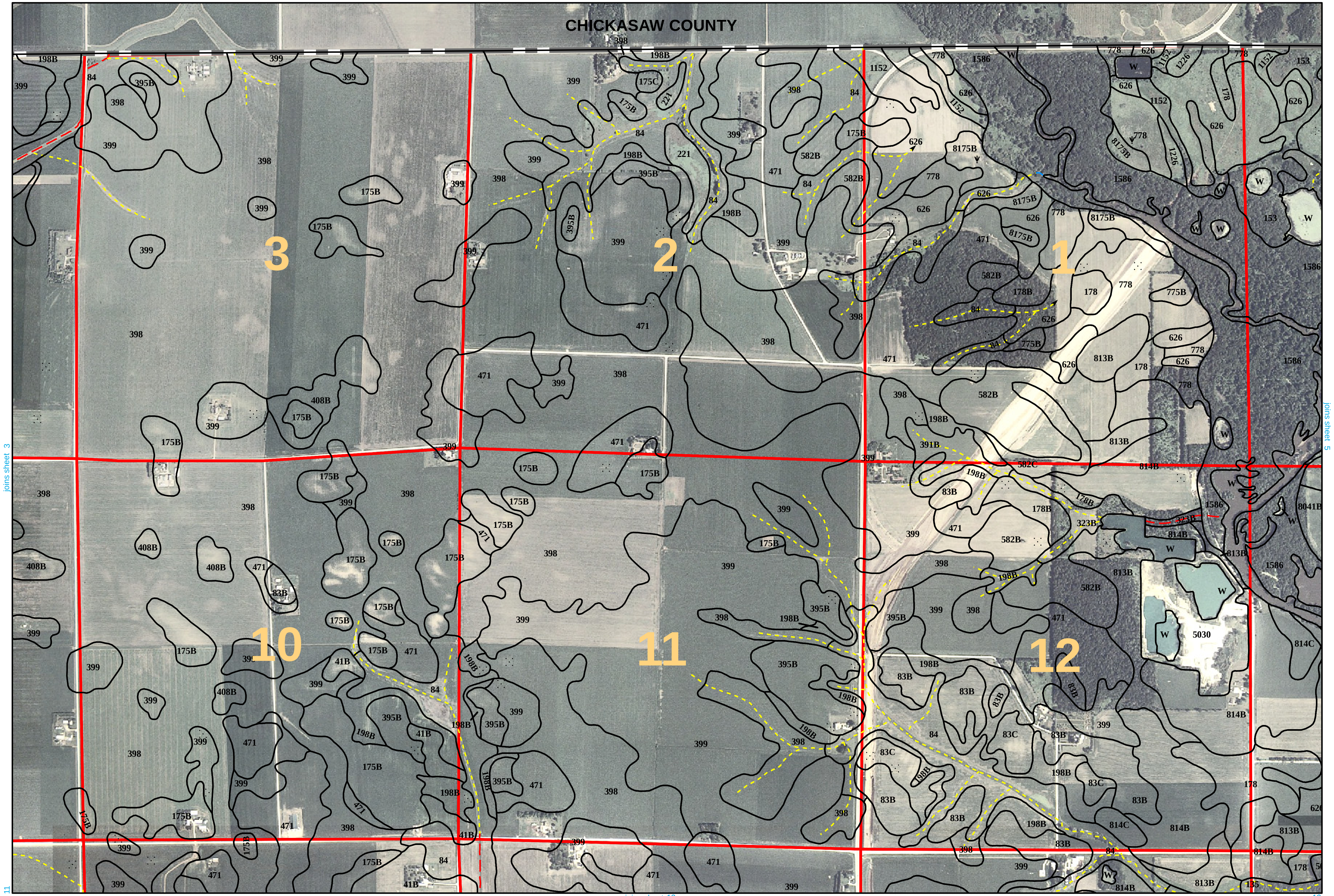

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Township 93N Range 12W

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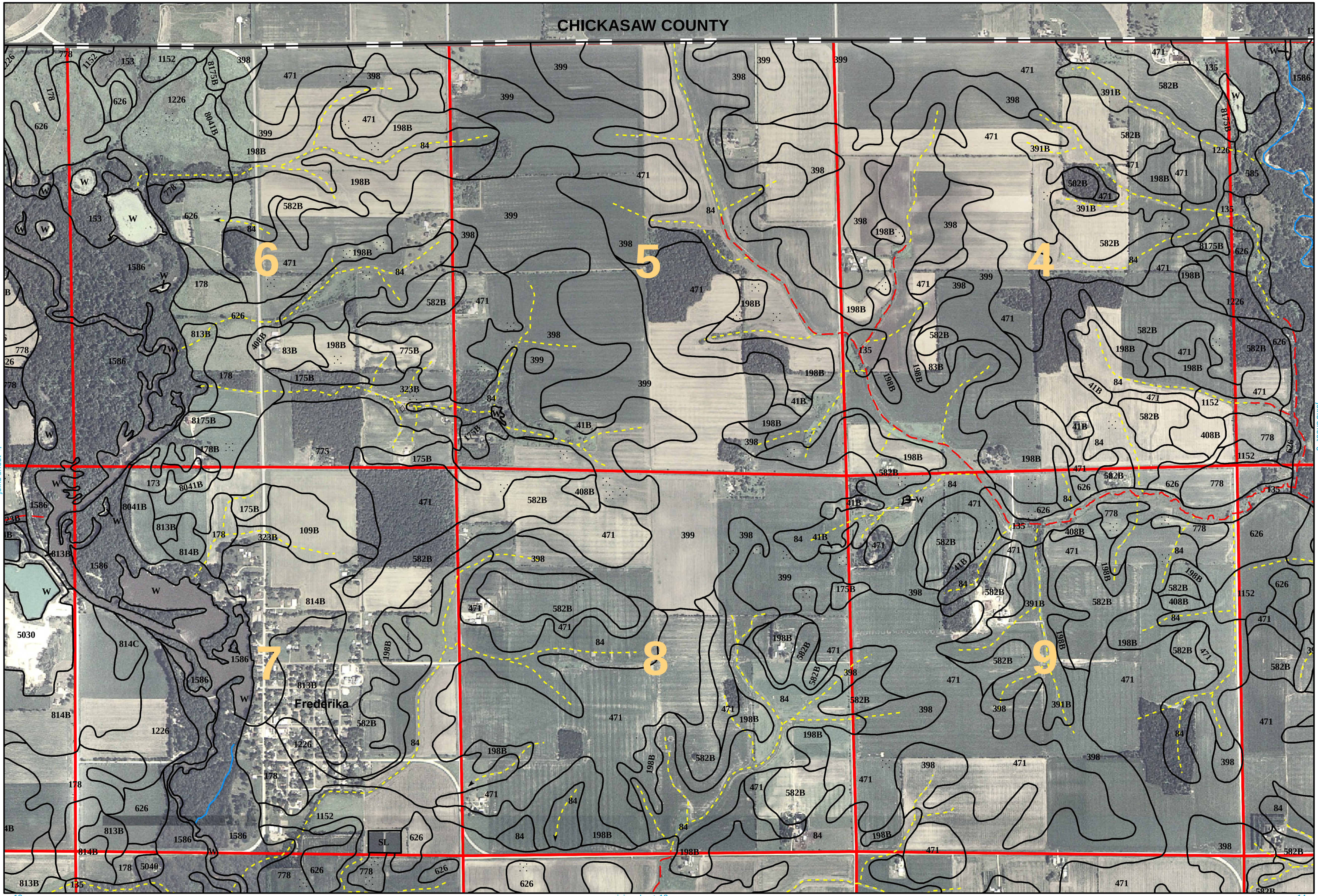

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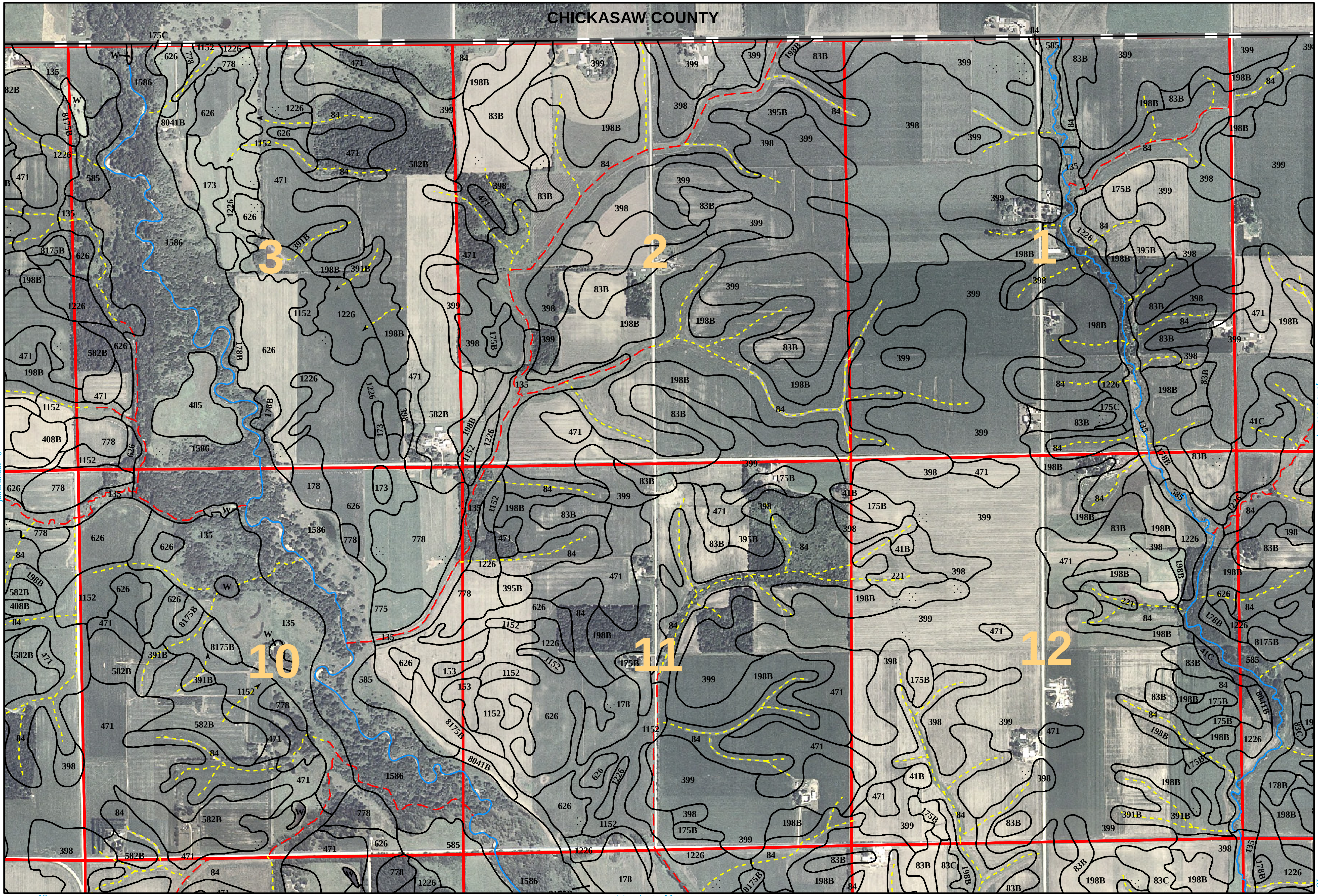

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Township 93N Range 11W

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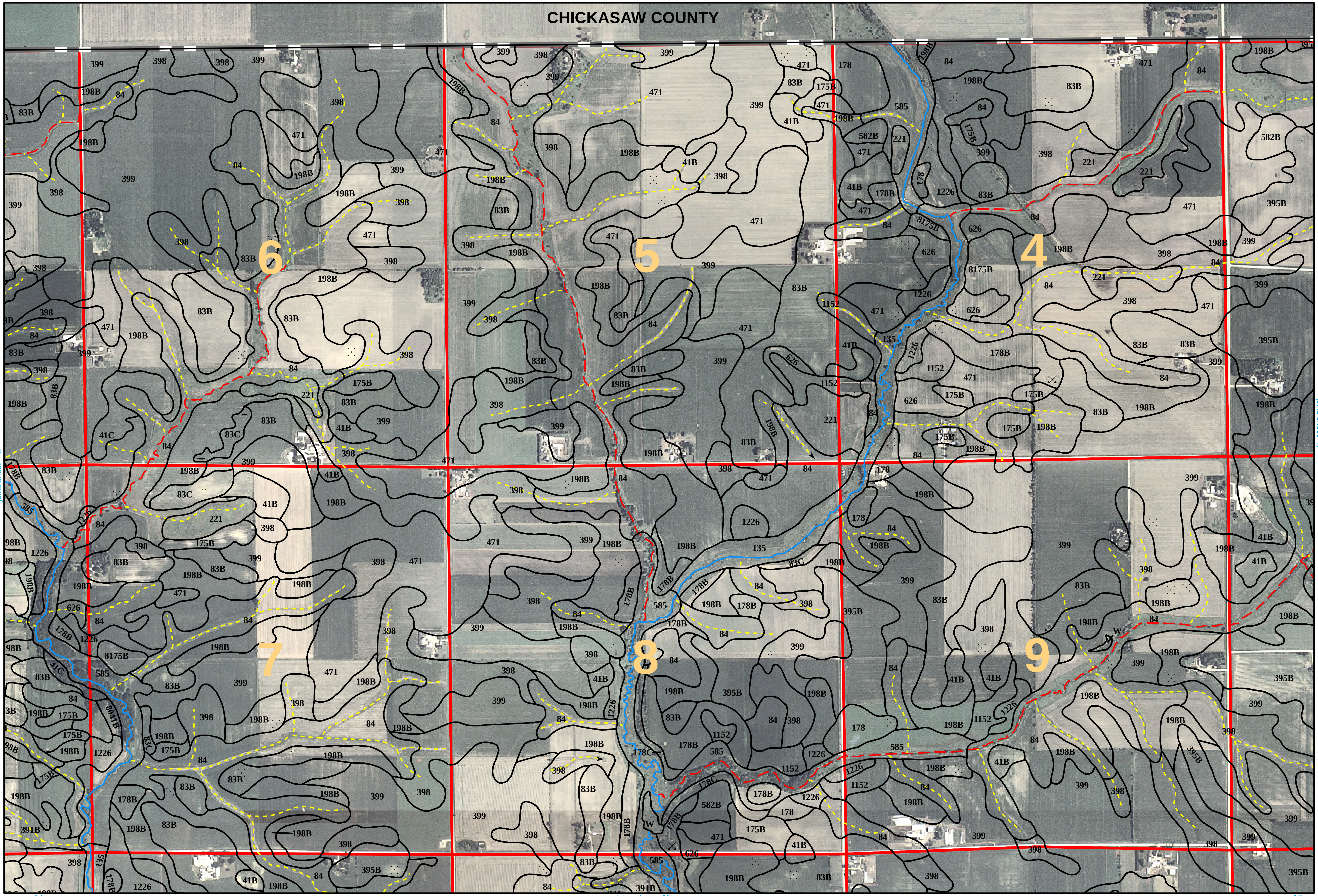

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Township 93N Range 11W

8

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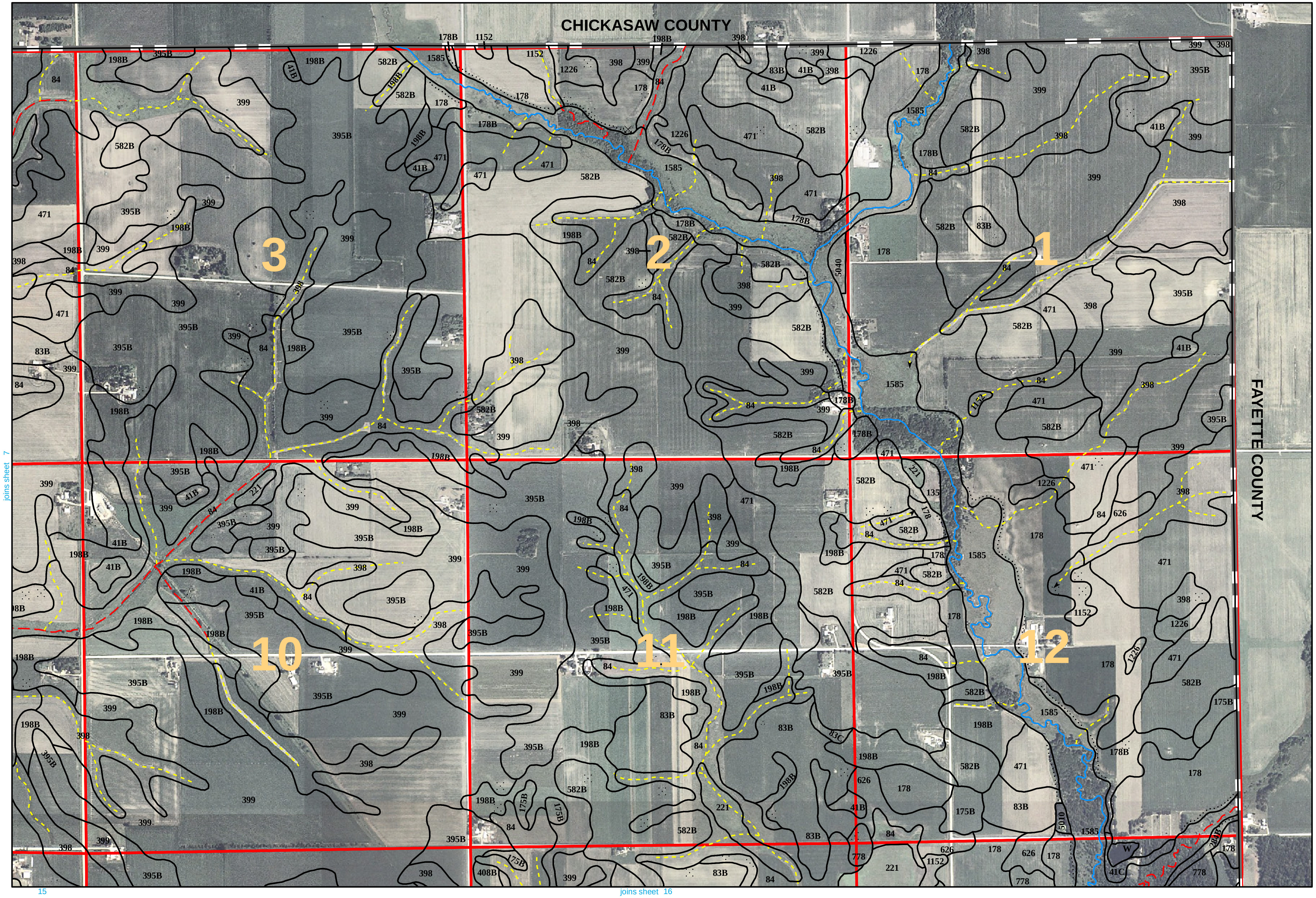

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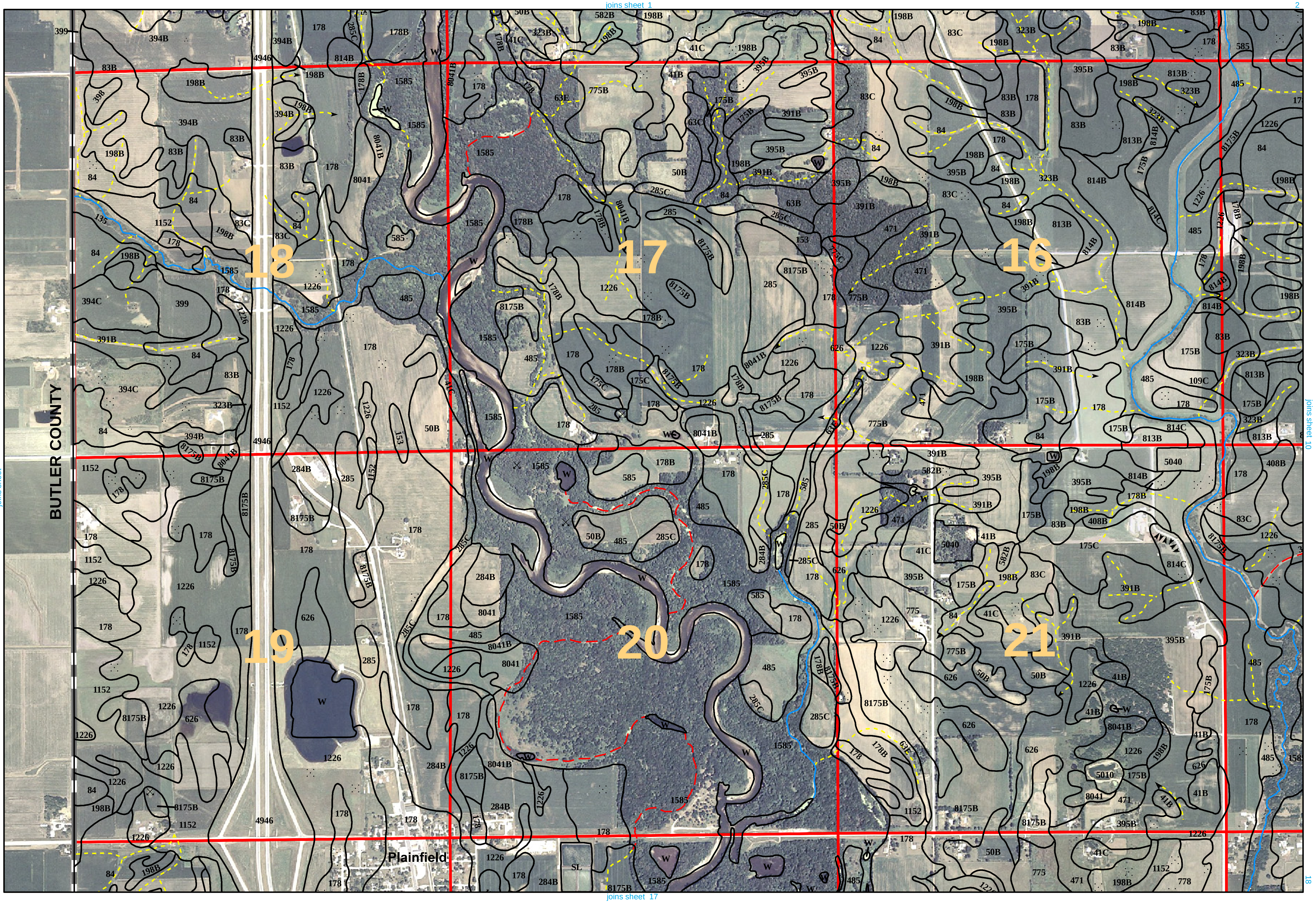
Township 93N Range 14W

9



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Township 93N Range 14W

10

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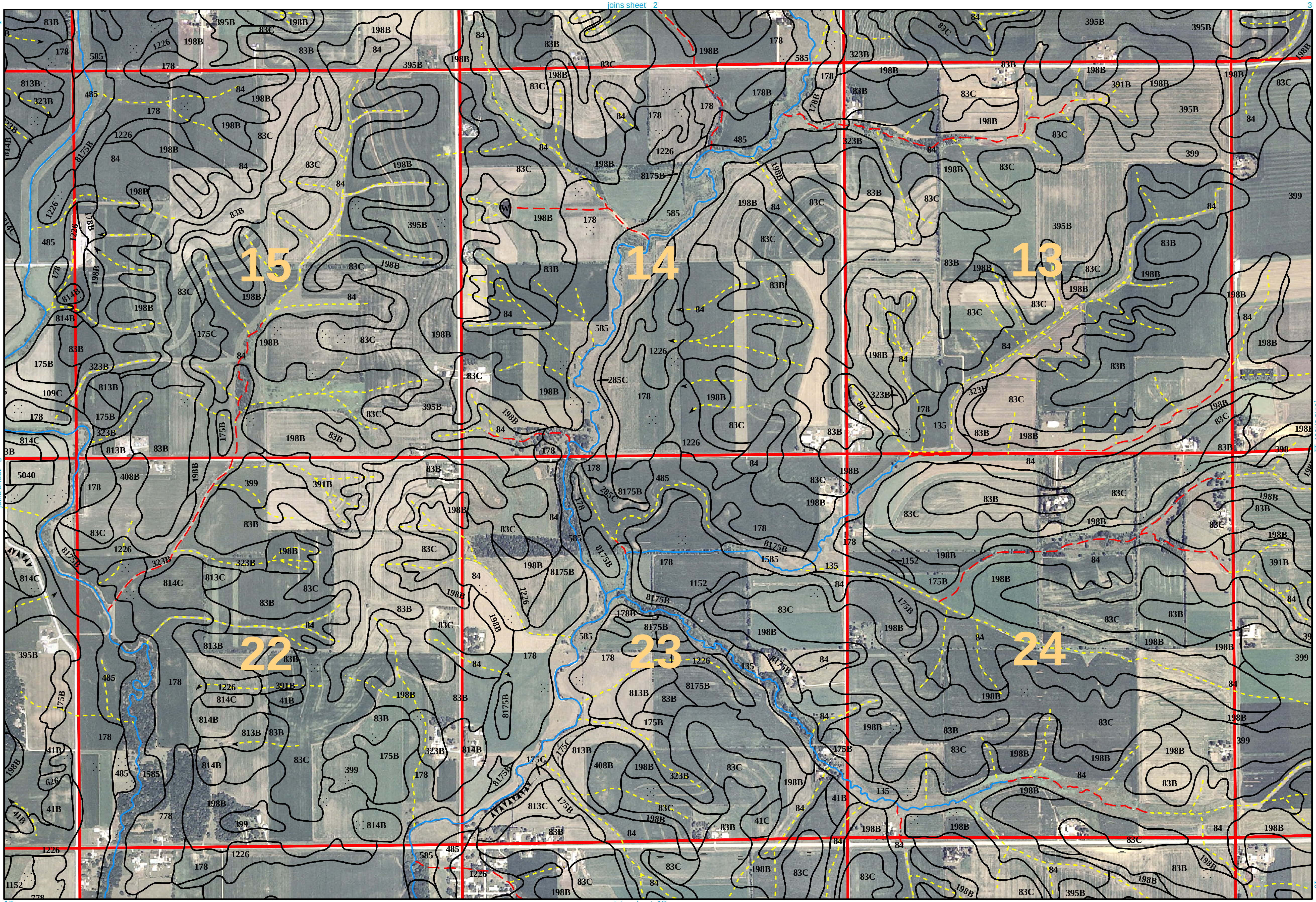

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0 1/4 1/2 3/4 1 Miles

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Township 93N Range 13W

11

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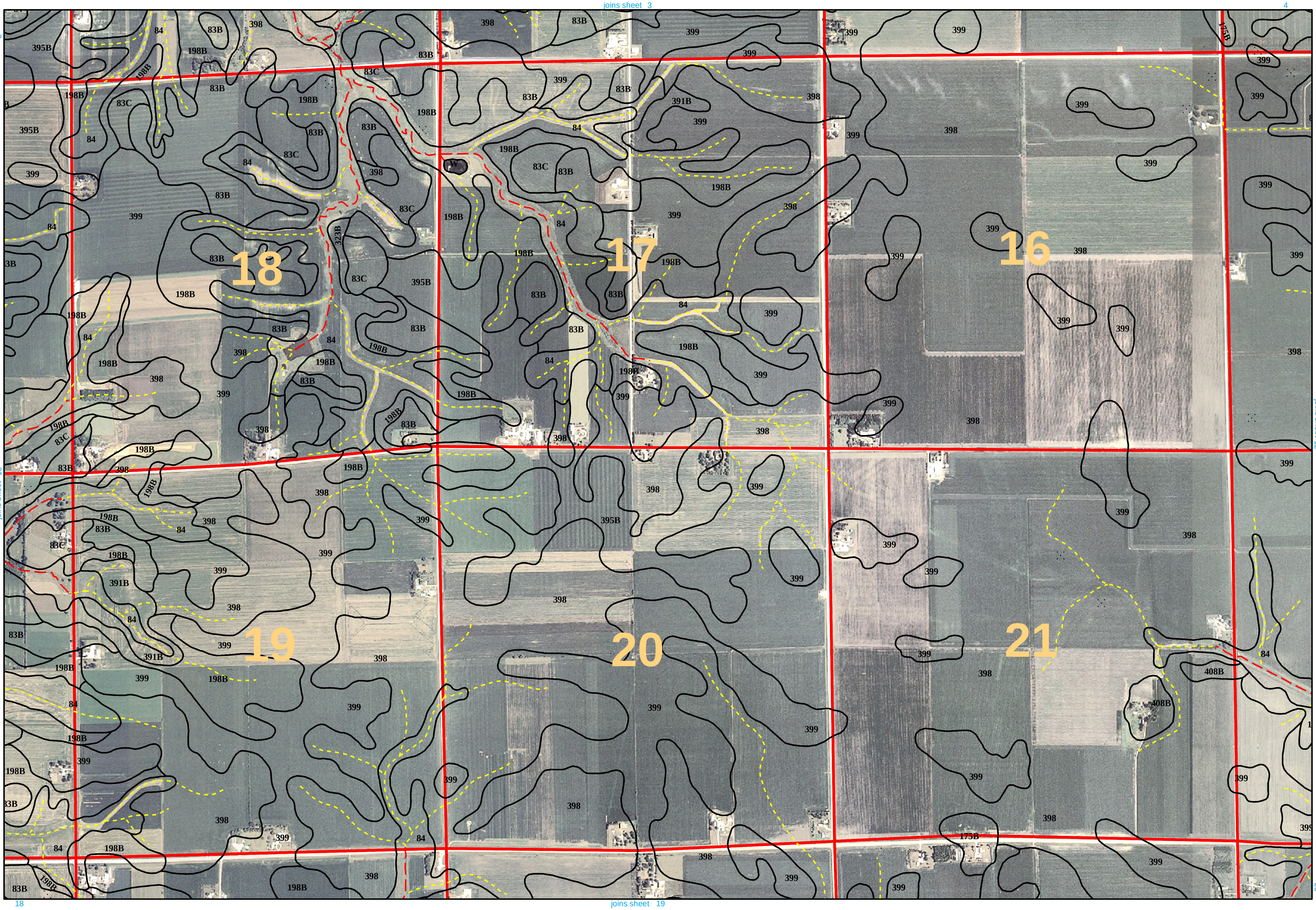

0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

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Township 93N Range 13W

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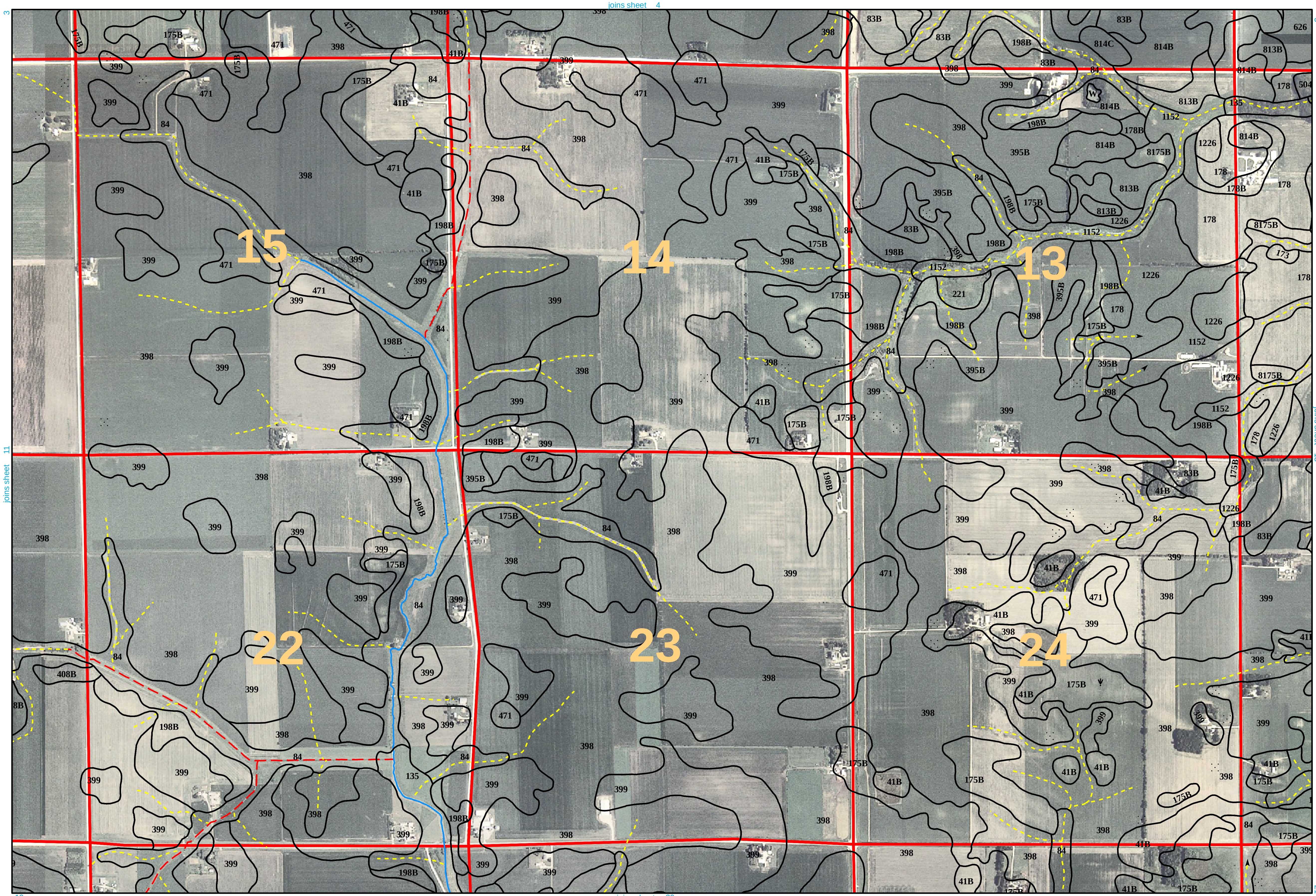

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Township 93N Range 12W

13

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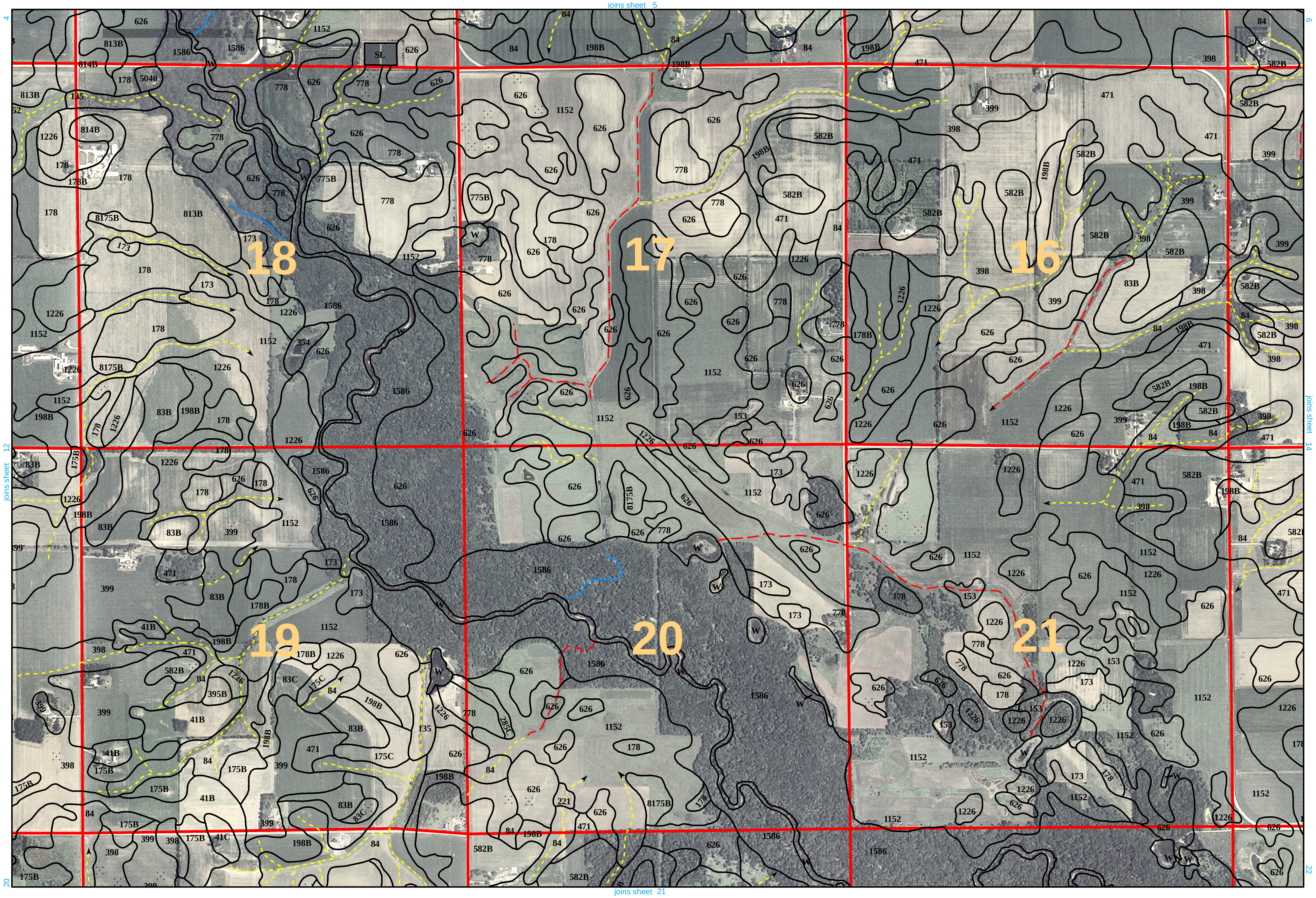

0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

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Township 93N Range 12W

14

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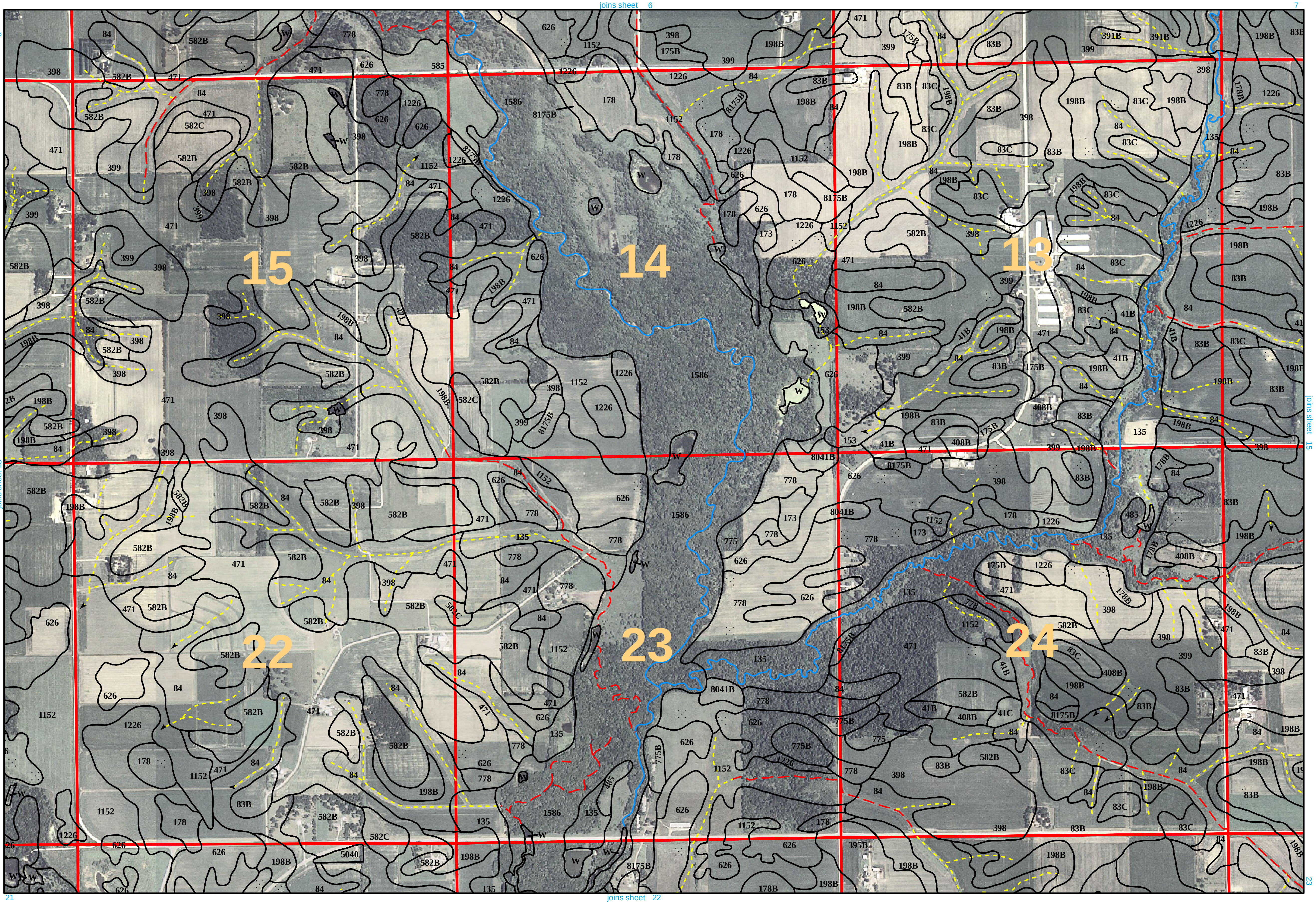

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0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

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Township 93N Range 11W

15

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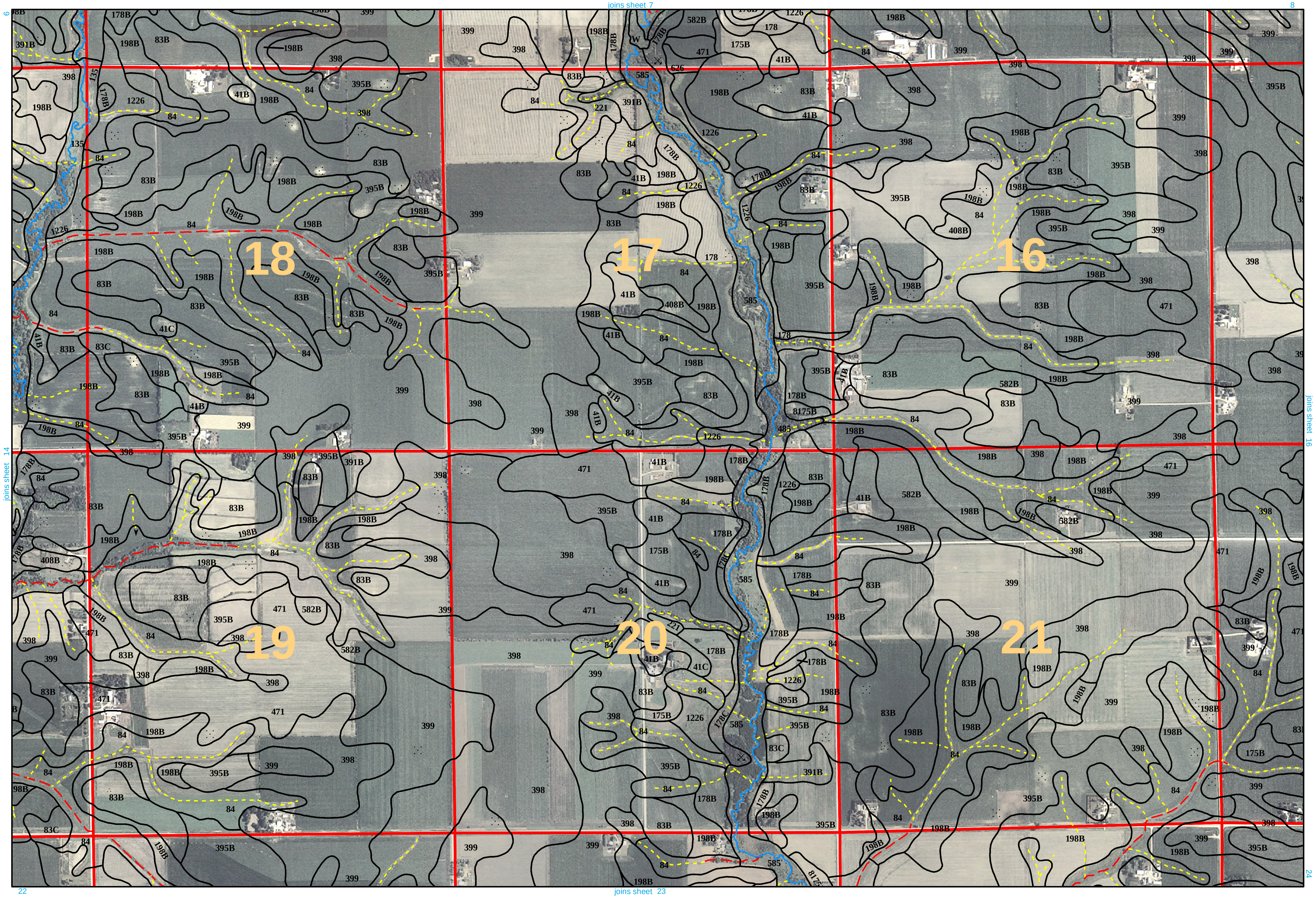

0 1/4 1/2 3/4 1 Miles

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Township 93N Range 11W

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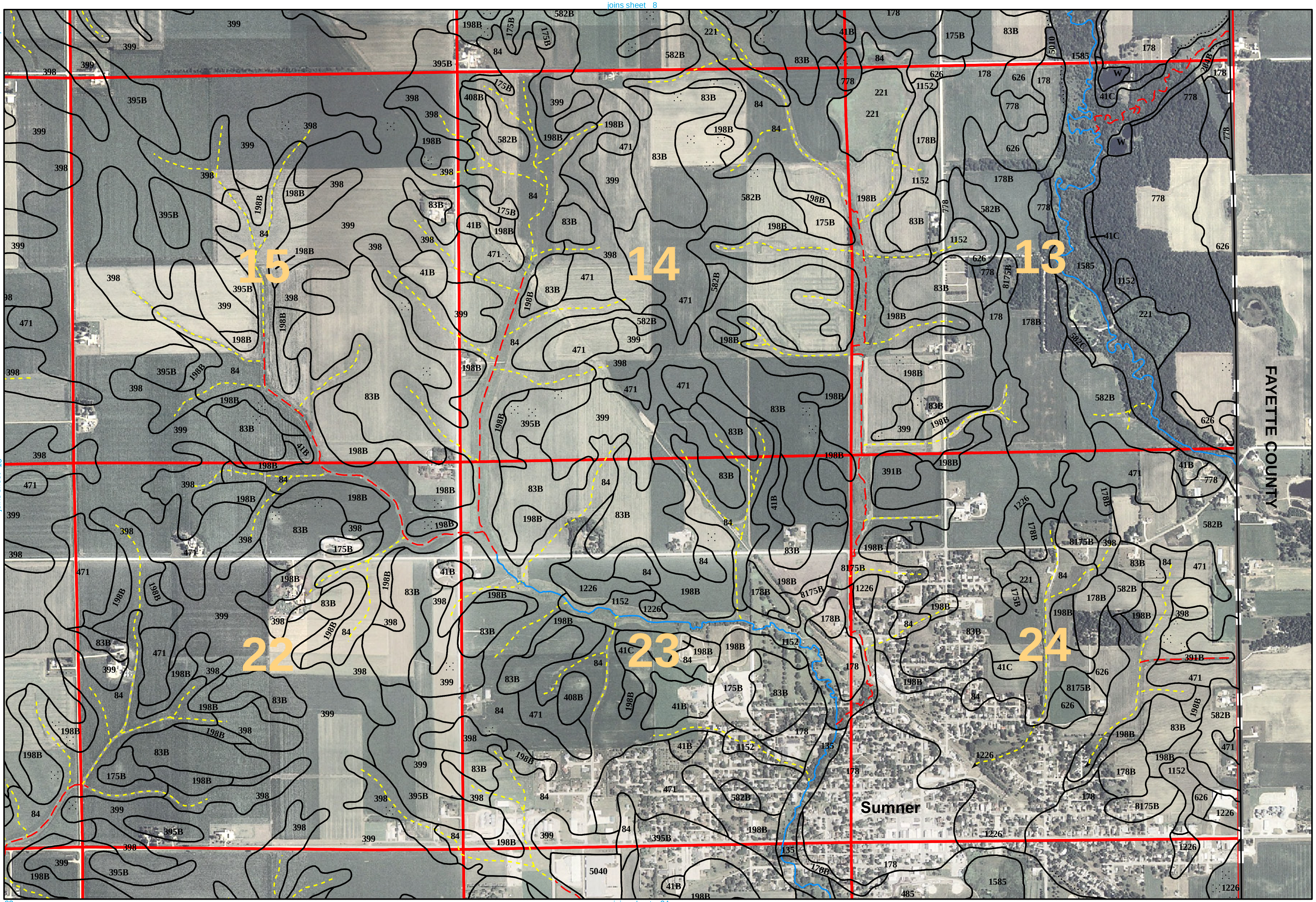

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0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

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NRCS Natural Resources Conservation Service

Township 93N Range 14W

17

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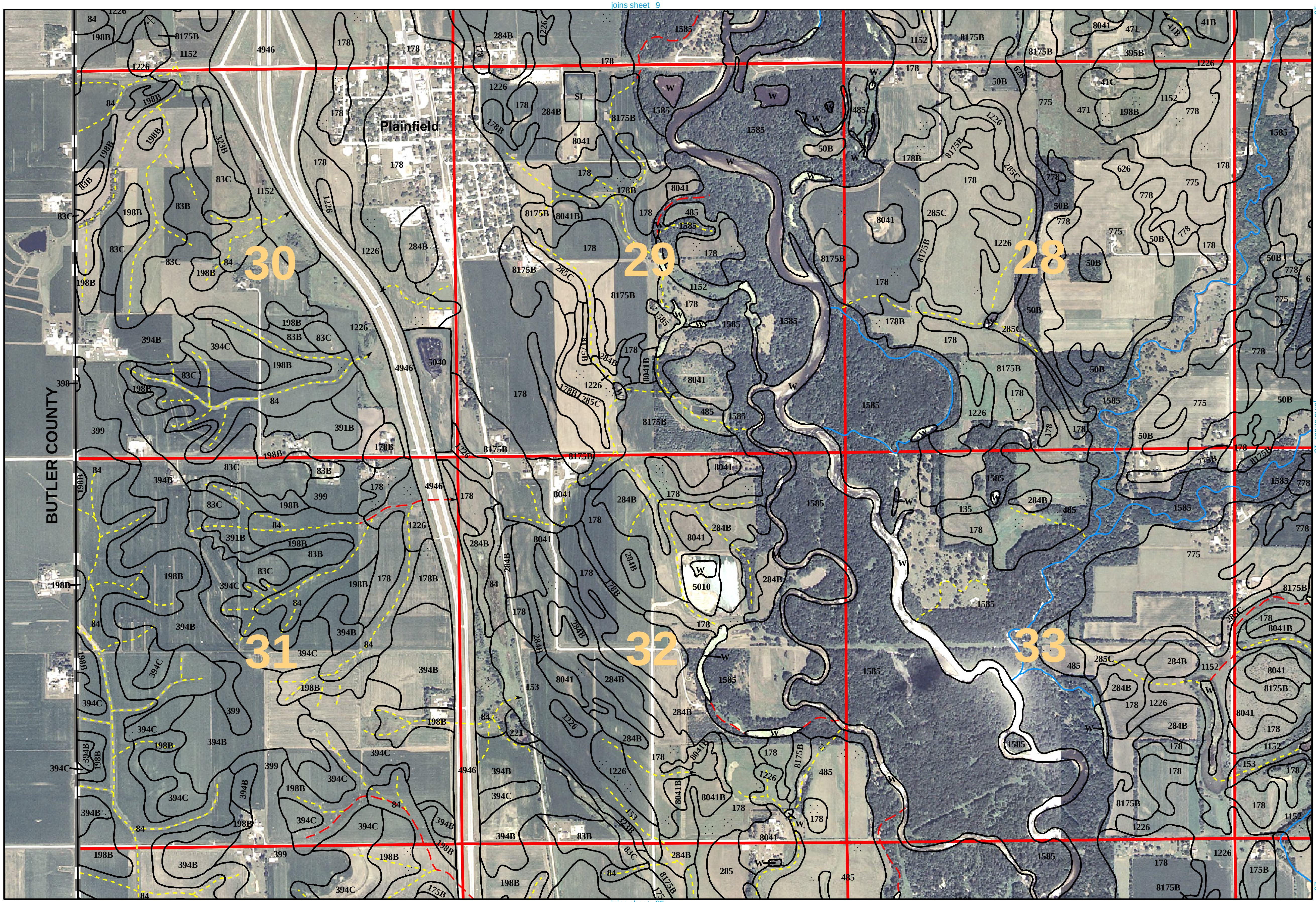

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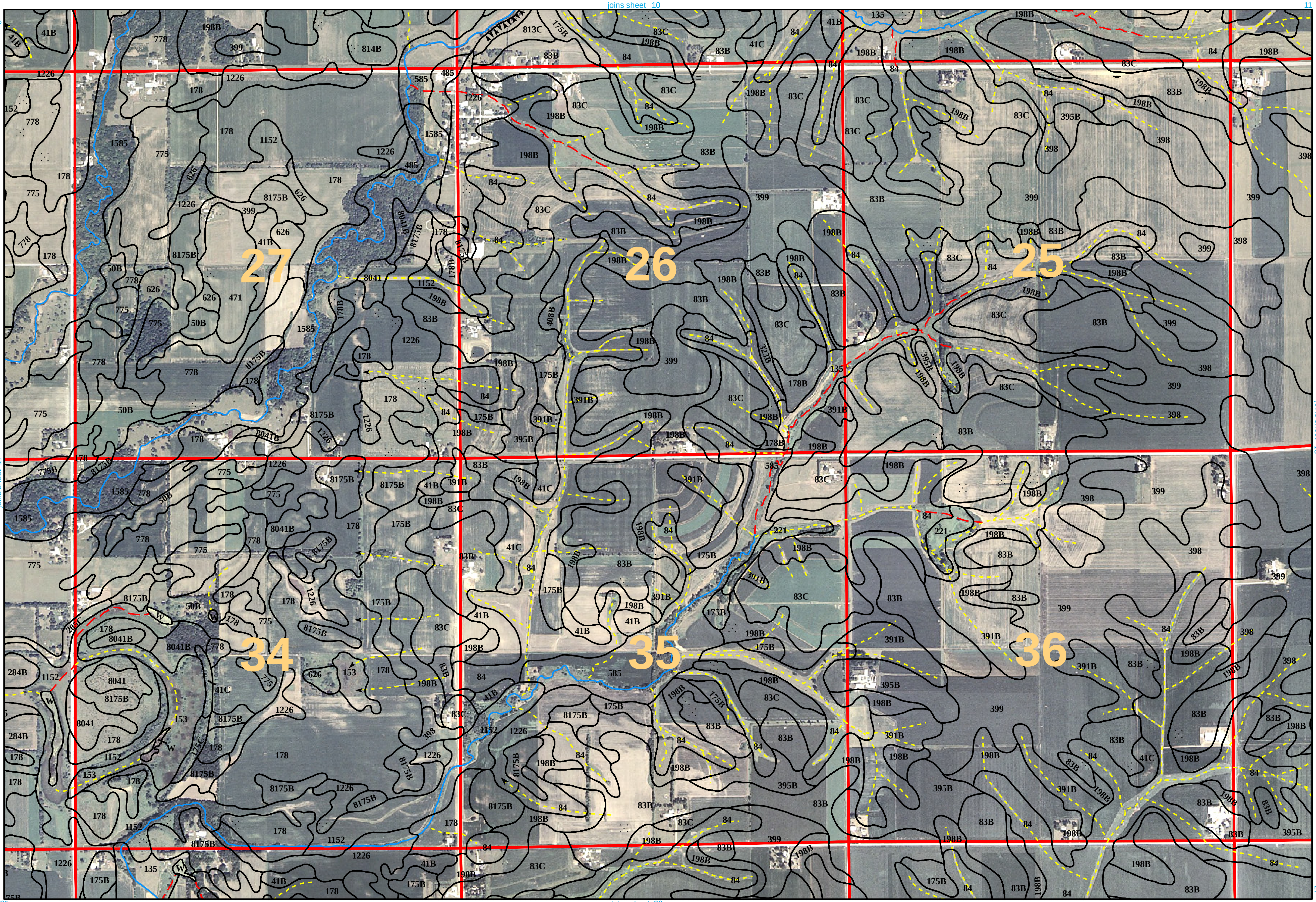
0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Township 93N Range 14W



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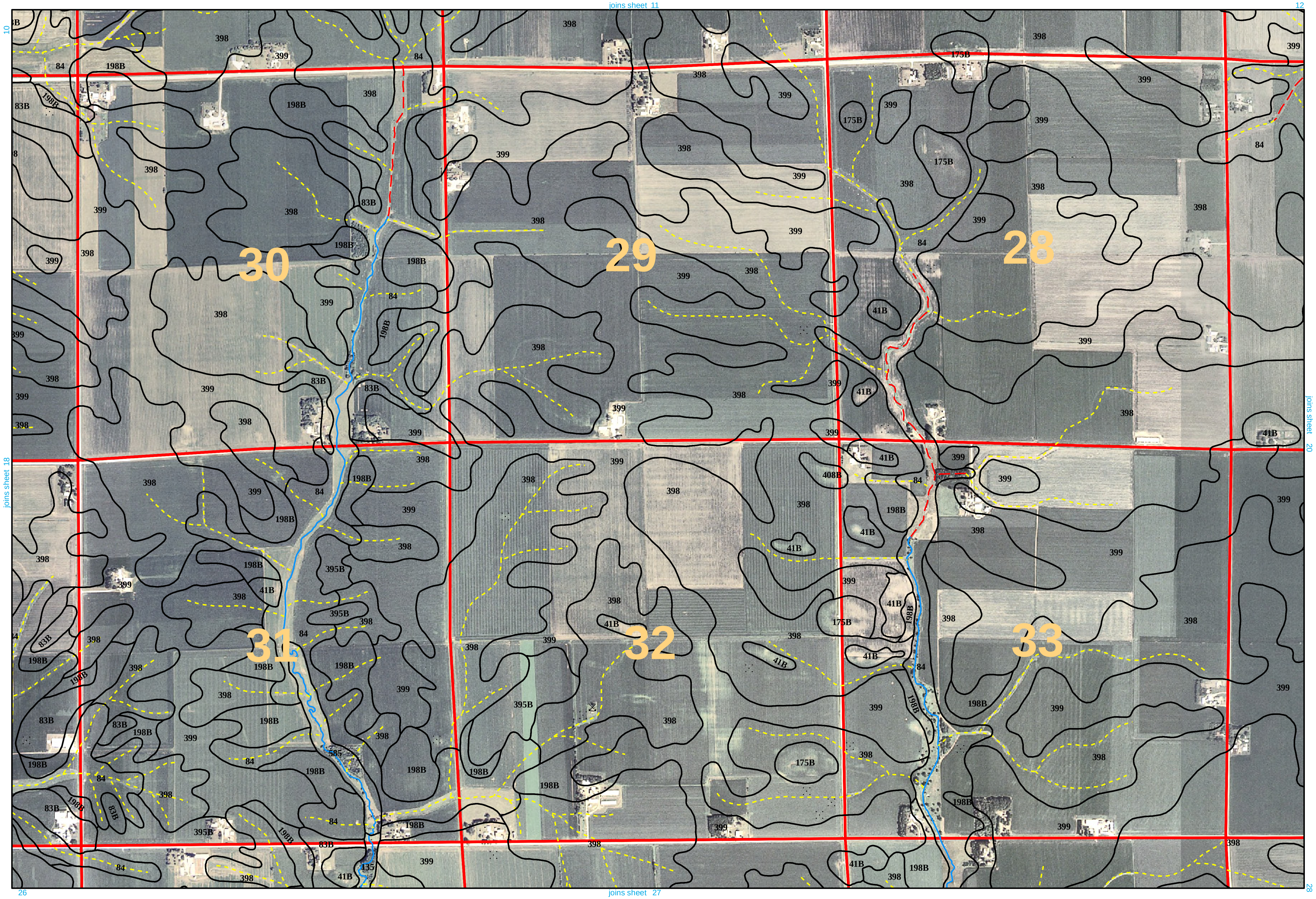
Township 93N Range 13W



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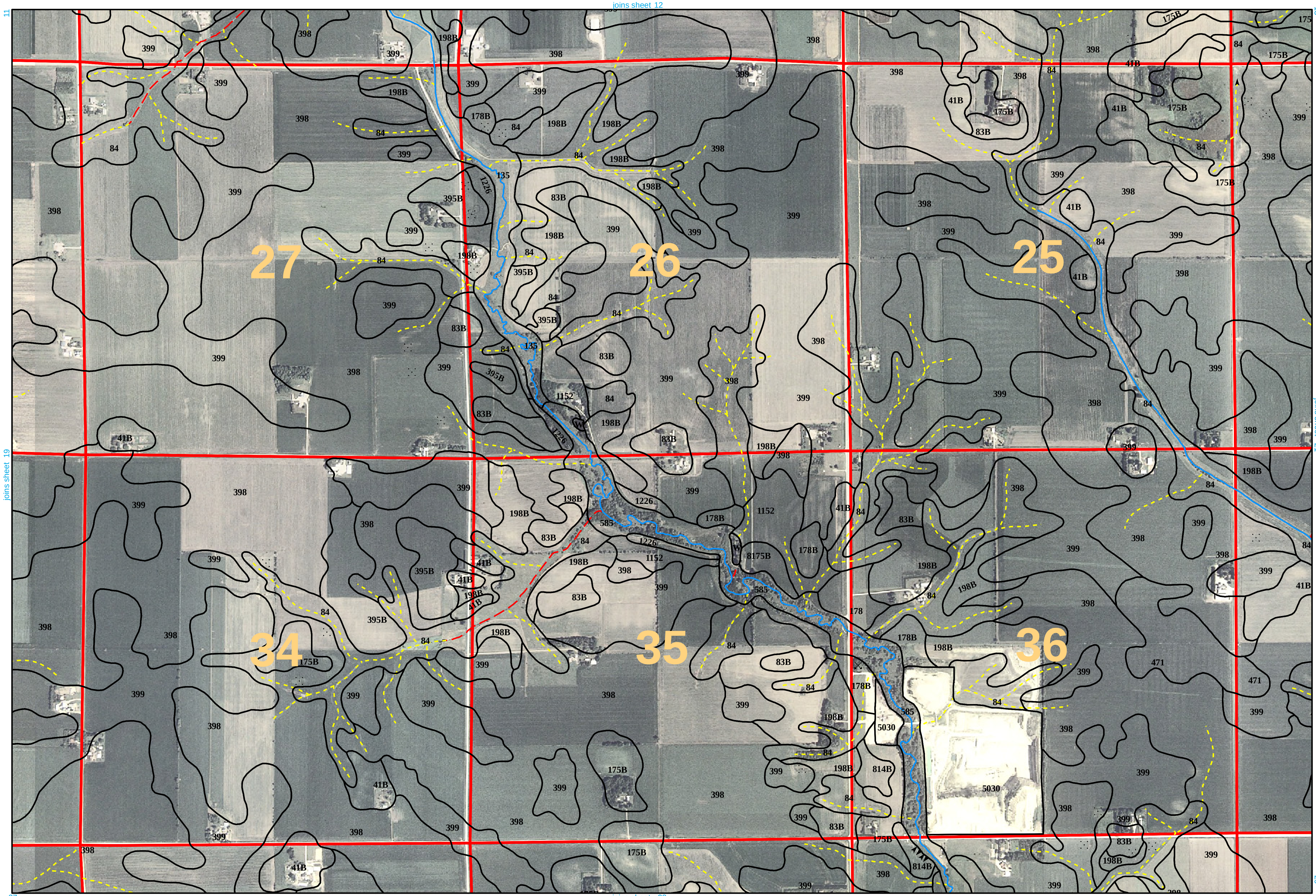
Township 93N Range 13W



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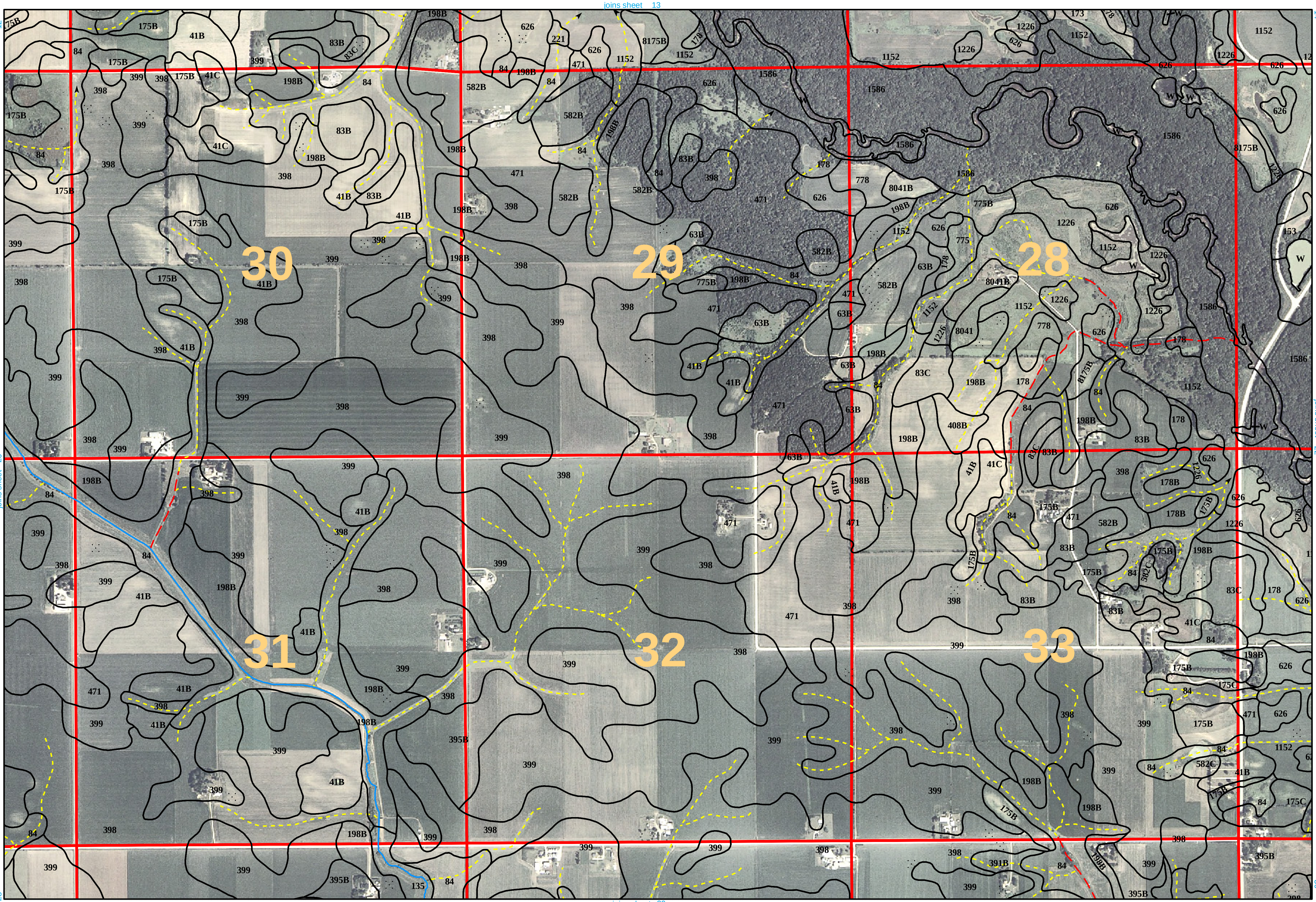
Township 93N Range 12W



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Township 93N Range 12W

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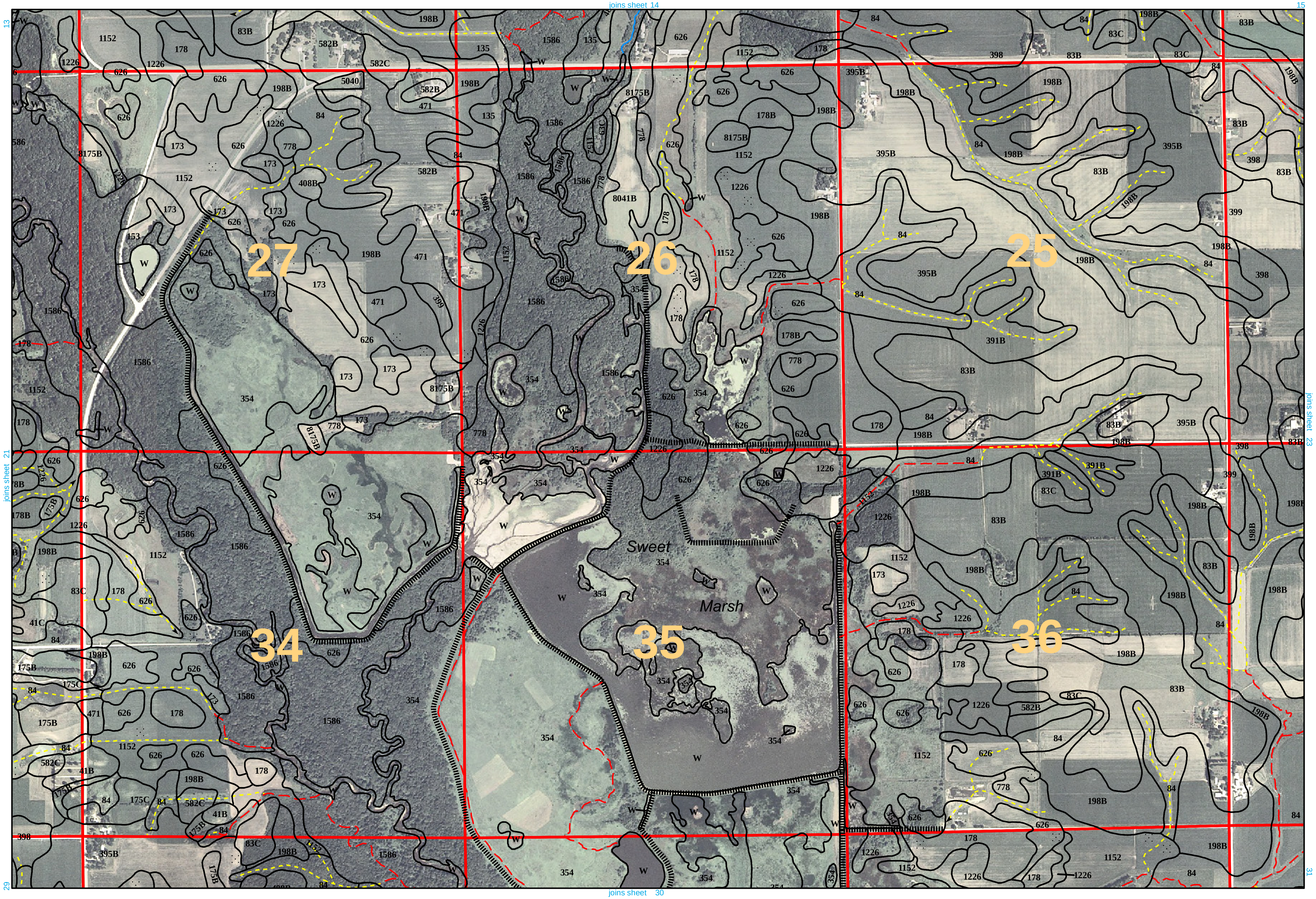

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0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Township 93N Range 11W

Soil Survey of Bremer County, Iowa

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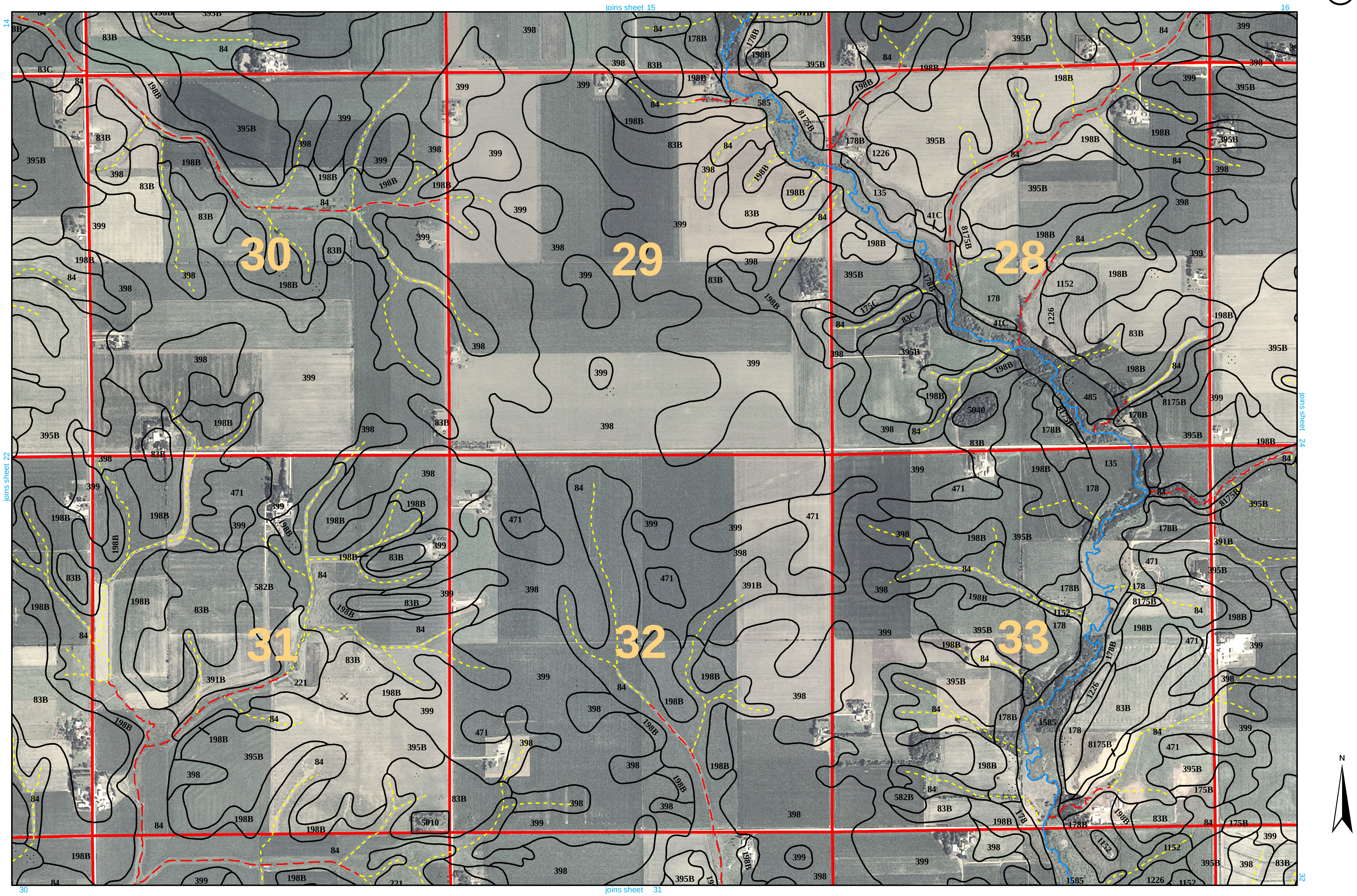

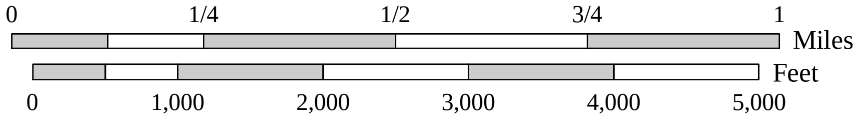

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United States Department of Agriculture
NRCS Natural Resources Conservation Service

Township 93N Range 11W

24

Soil Survey of Bremer County, Iowa

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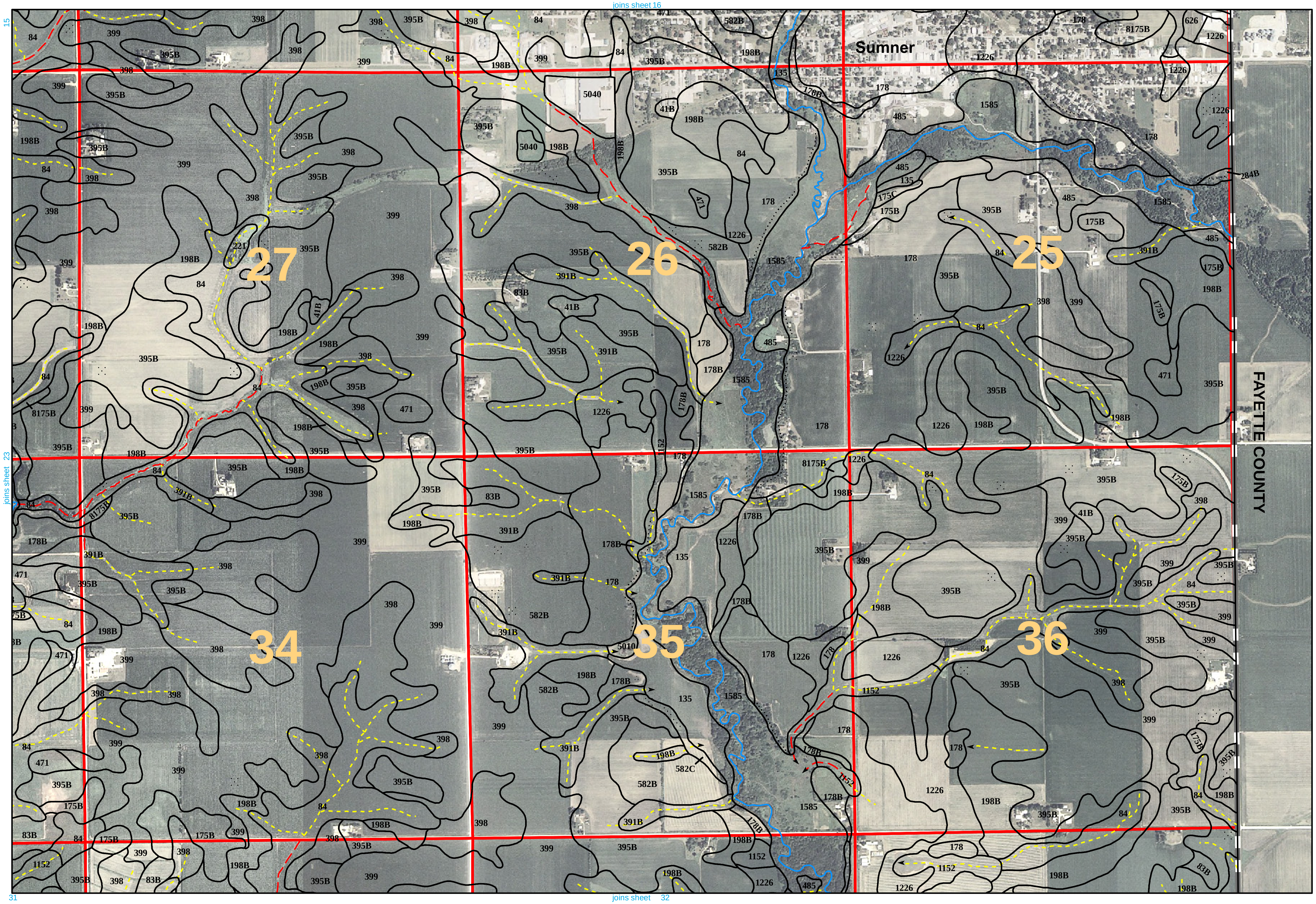

0 1/4 1/2 3/4 1 Miles

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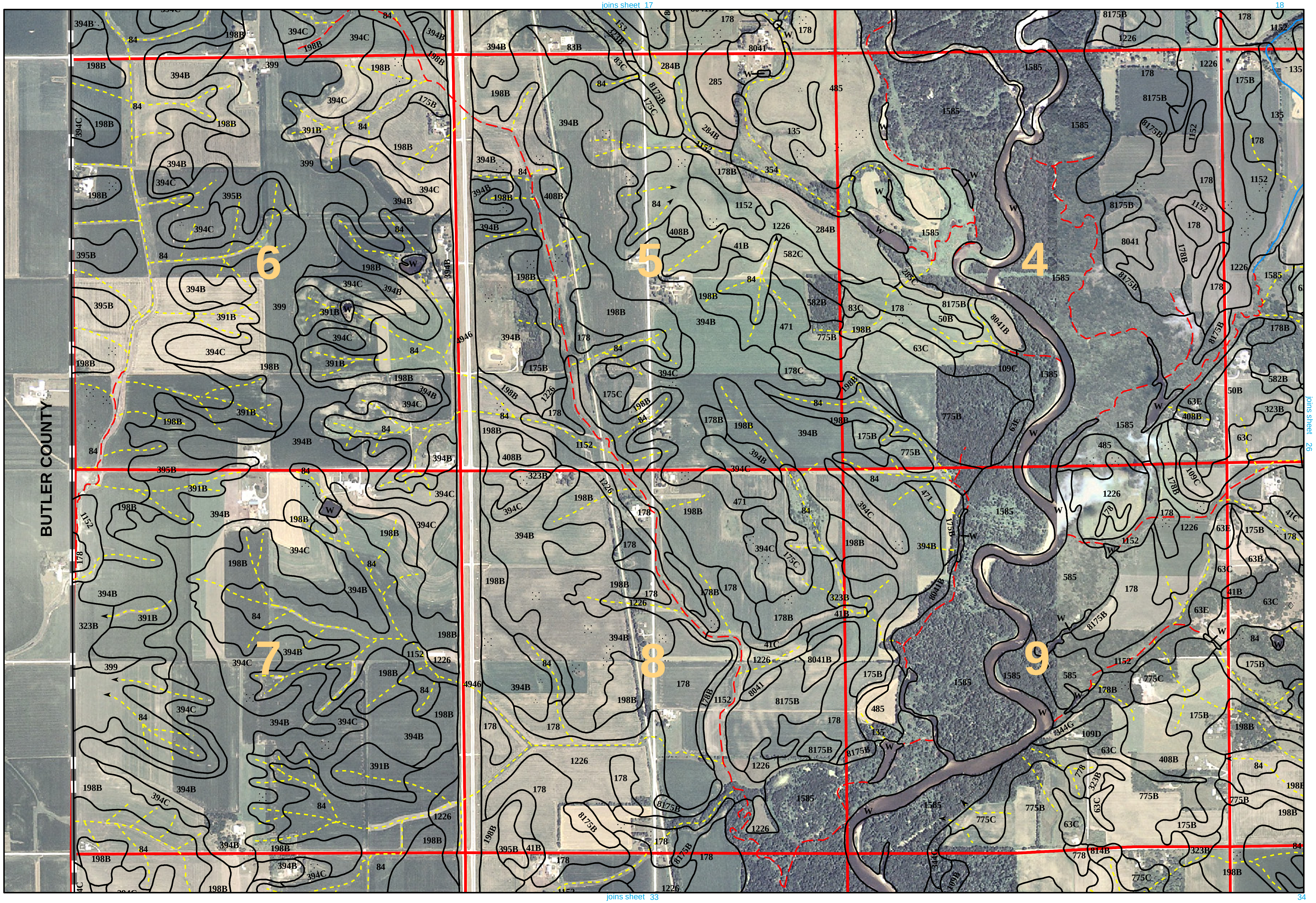
United States Department of Agriculture
NRCS Natural Resources Conservation Service

Township 92N Range 14W



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Soil Survey of Bremer County, Iowa

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0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Township 92N Range 14W

26

Soil Survey of Bremer County, Iowa

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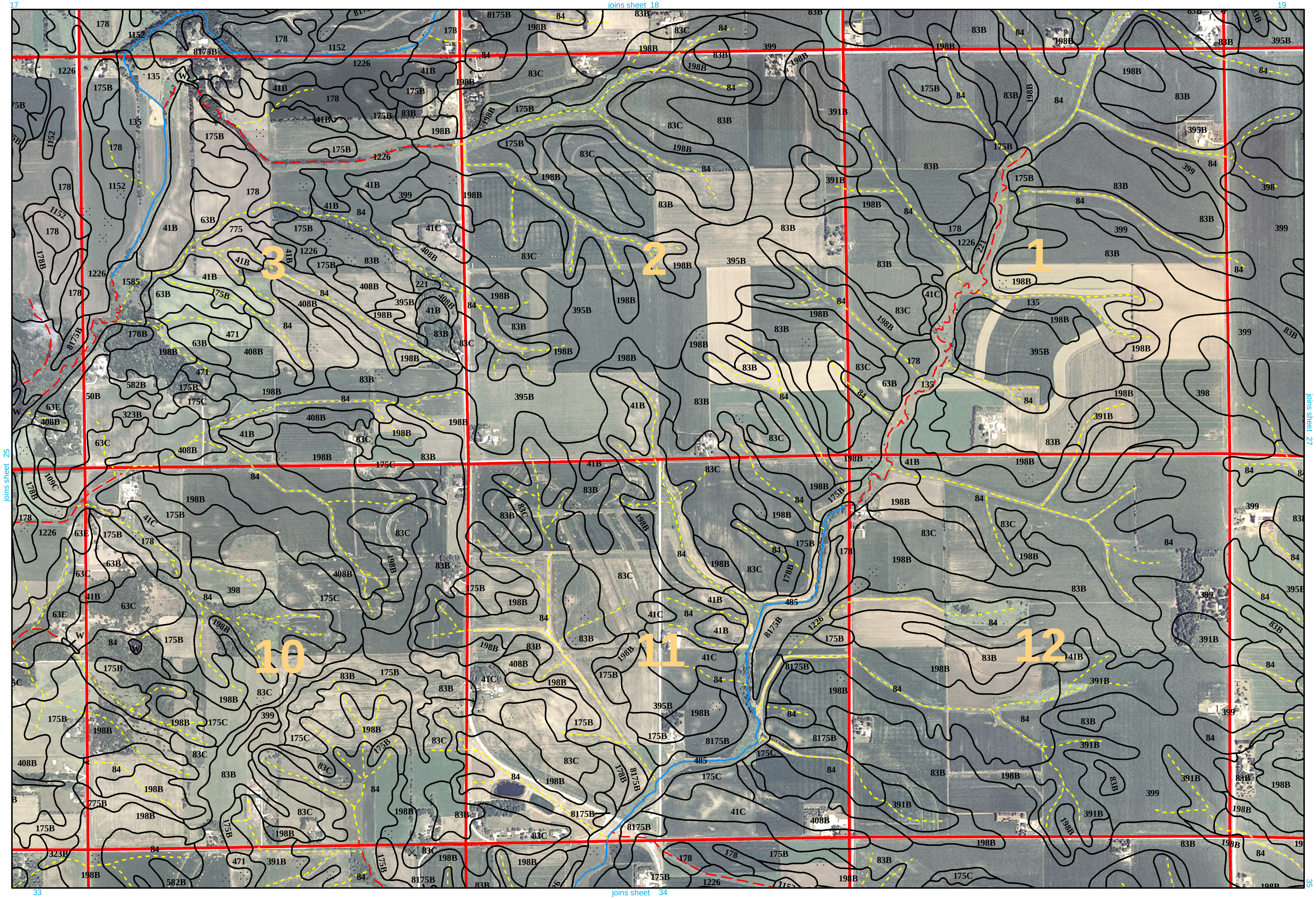

0 1/4 1/2 3/4 1 Miles

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United States Department of Agriculture
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Township 92N Range 13W

Soil Survey of Bremer County, Iowa

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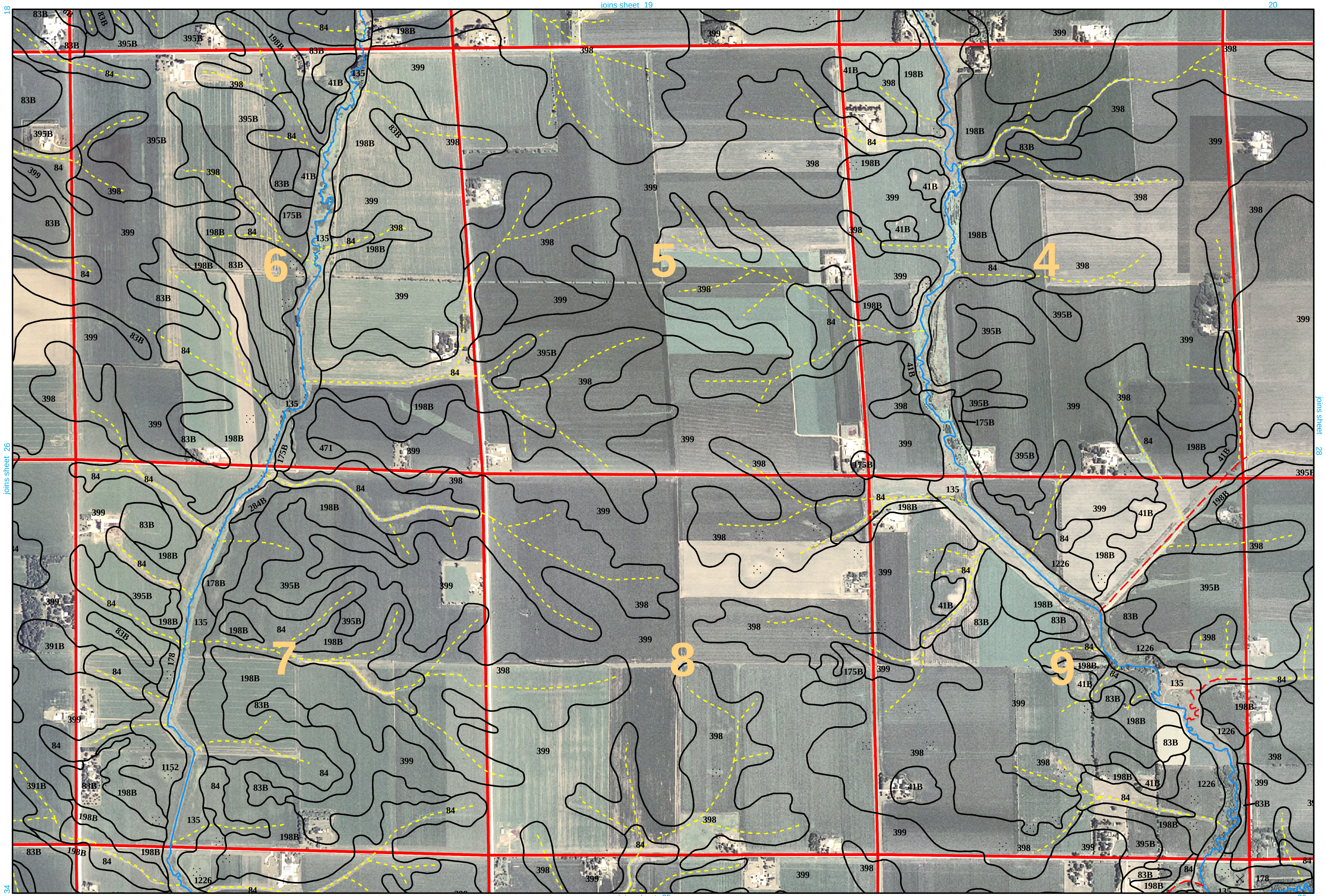

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Township 92N Range 13W

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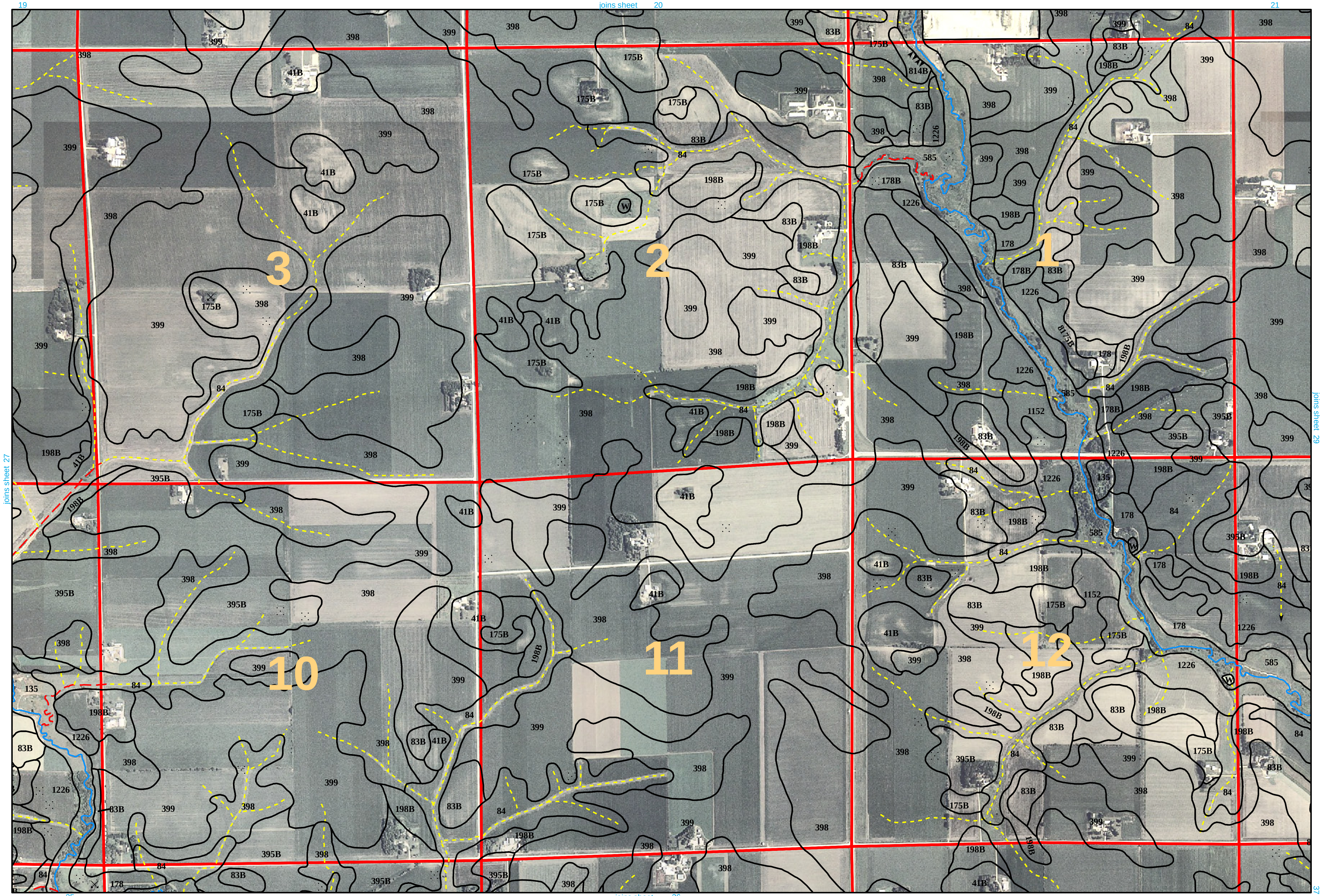

0 1/4 1/2 3/4 1 Miles

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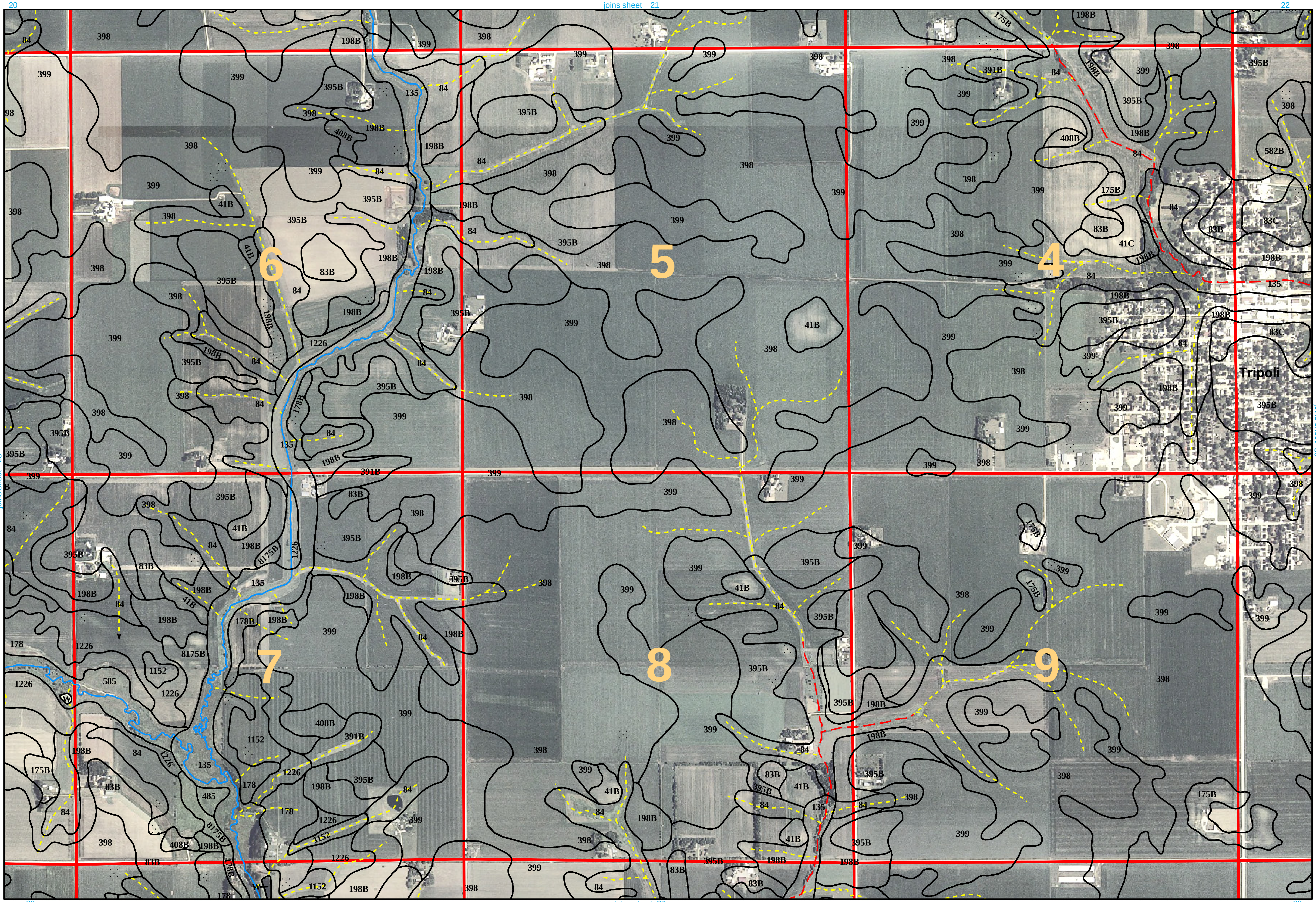
Township 92N Range 12W



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0 1/4 1/2 3/4 1 Miles

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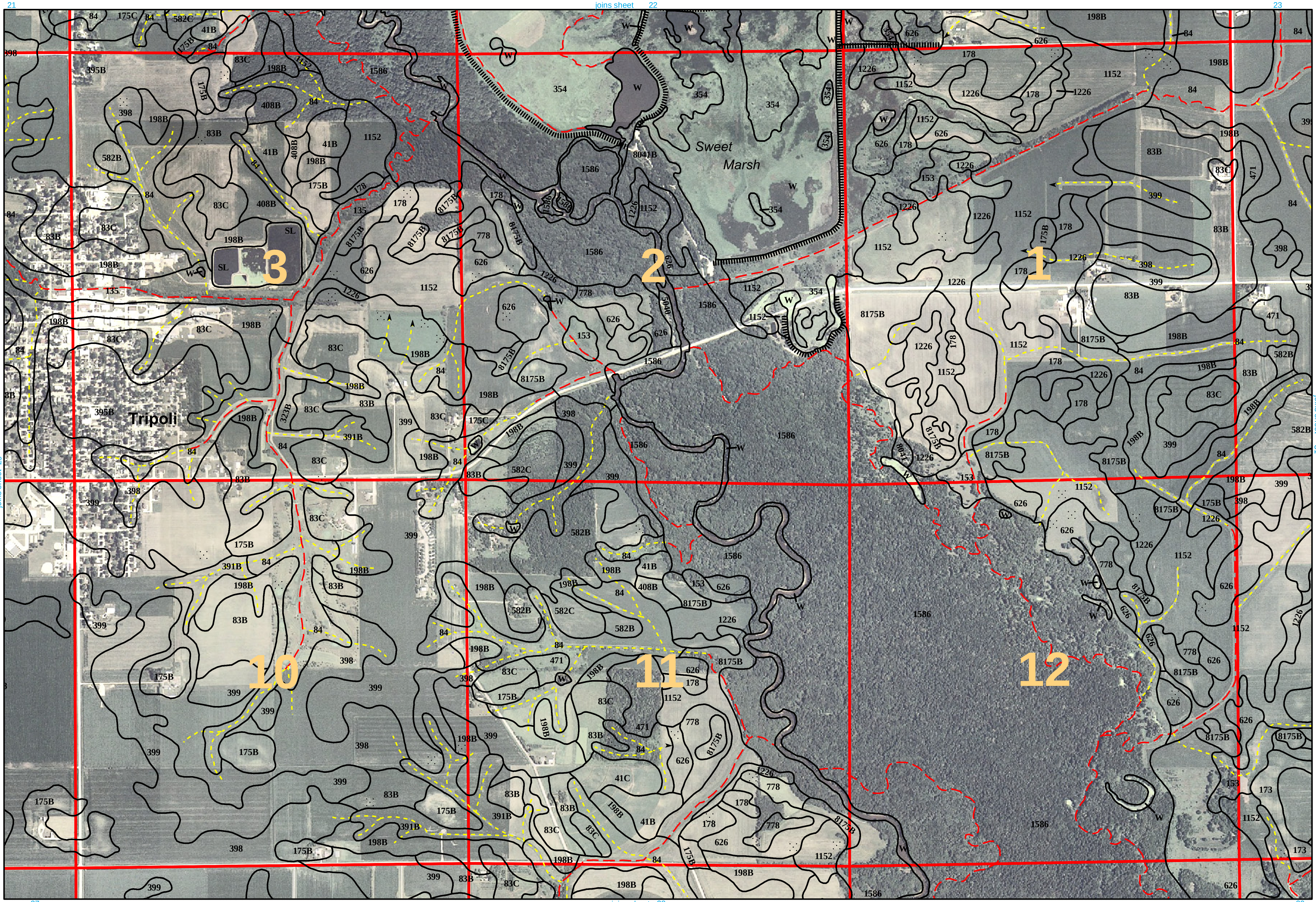
United States Department of Agriculture
NRCS Natural Resources Conservation Service

Township 92N Range 12W



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0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Township 92N Range 11W

Soil Survey of Bremer County, Iowa

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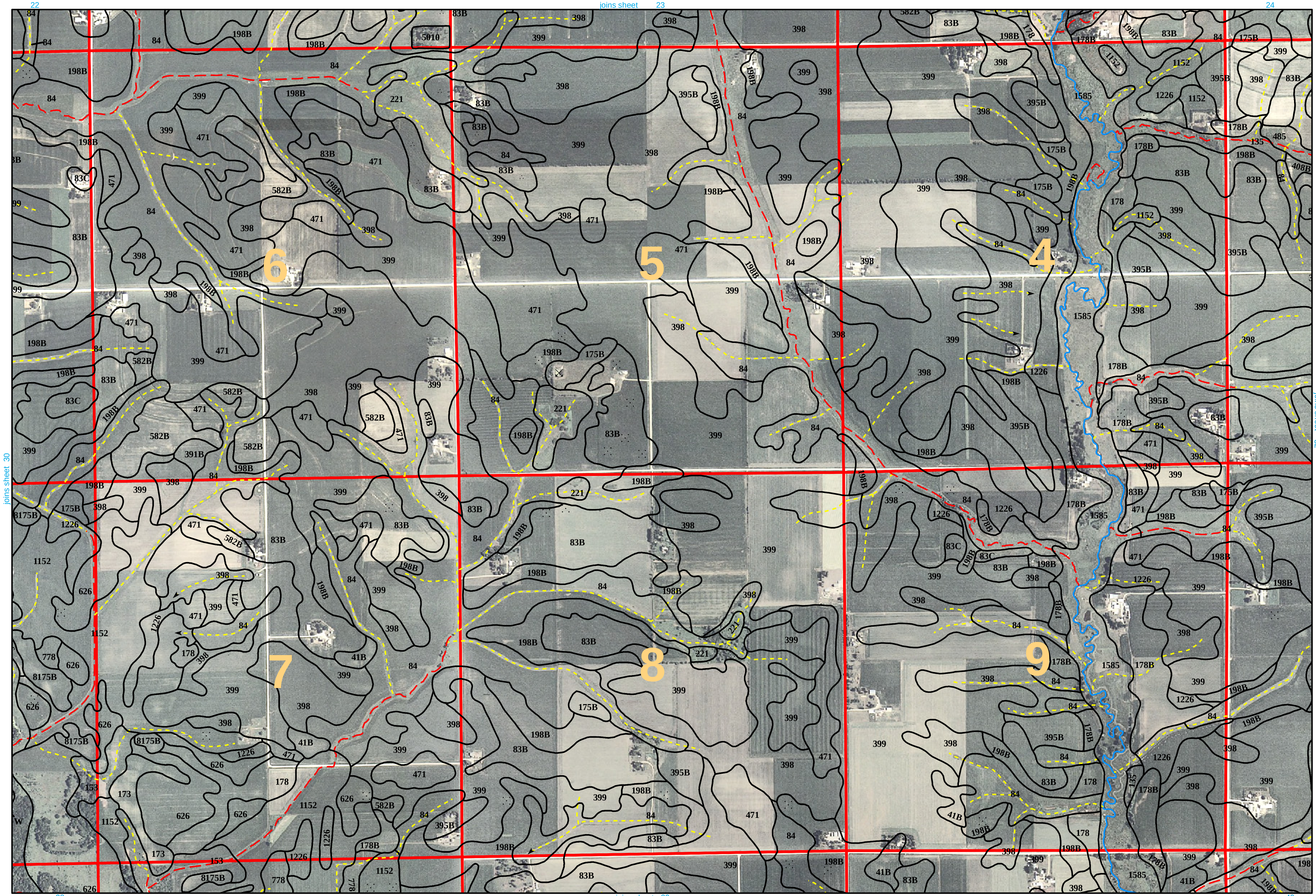

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0 — 1/4 — 1/2 — 3/4 — 1 Miles

0 — 1,000 — 2,000 — 3,000 — 4,000 — 5,000 Feet

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Township 92N Range 11W

32

Soil Survey of Bremer County, Iowa

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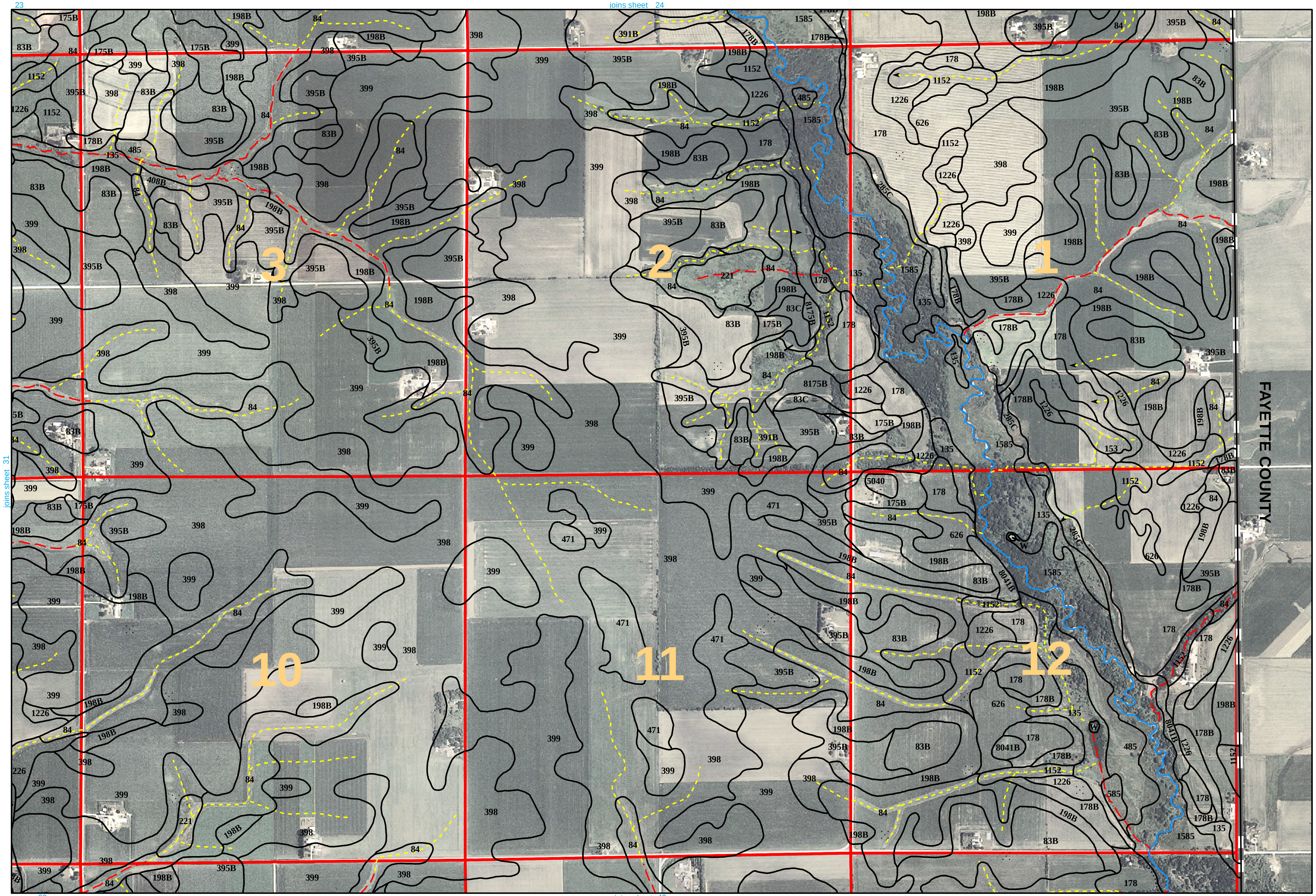

0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Township 92N Range 14W

33

Soil Survey of Bremer County, Iowa

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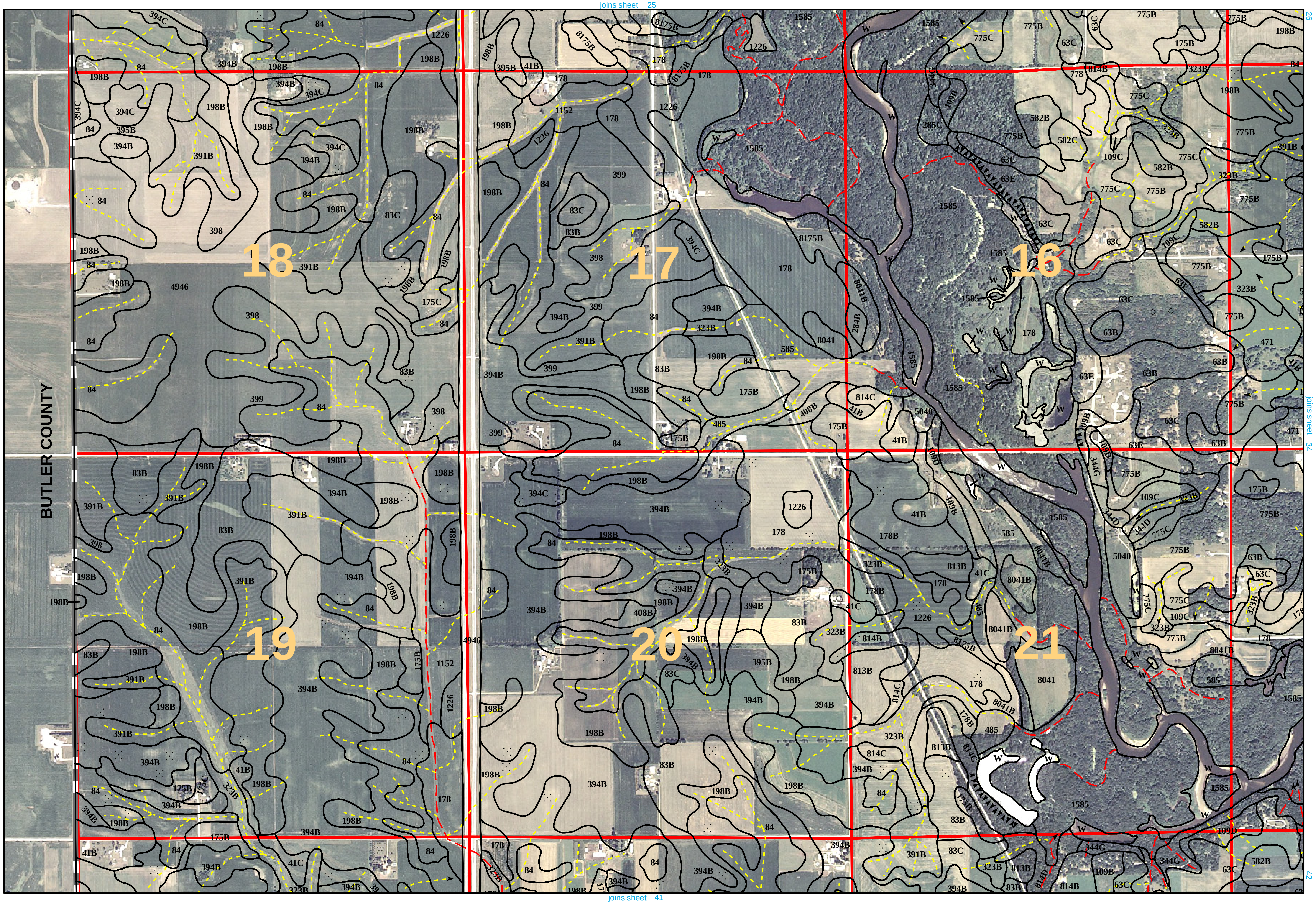

0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

Township 92N Range 14W

Soil Survey of Bremer County, Iowa

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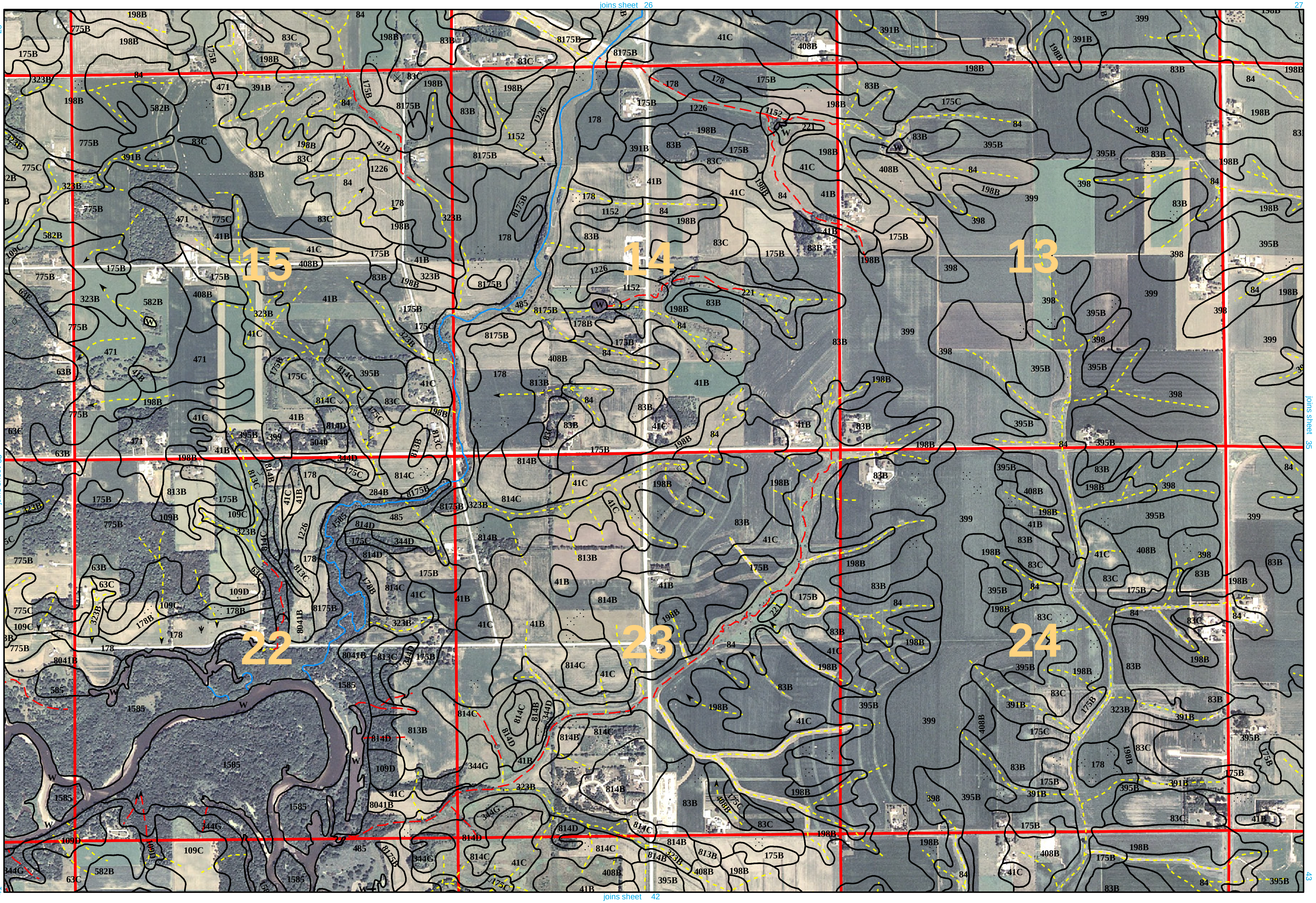

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0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

N

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Township 92N Range 13W

35

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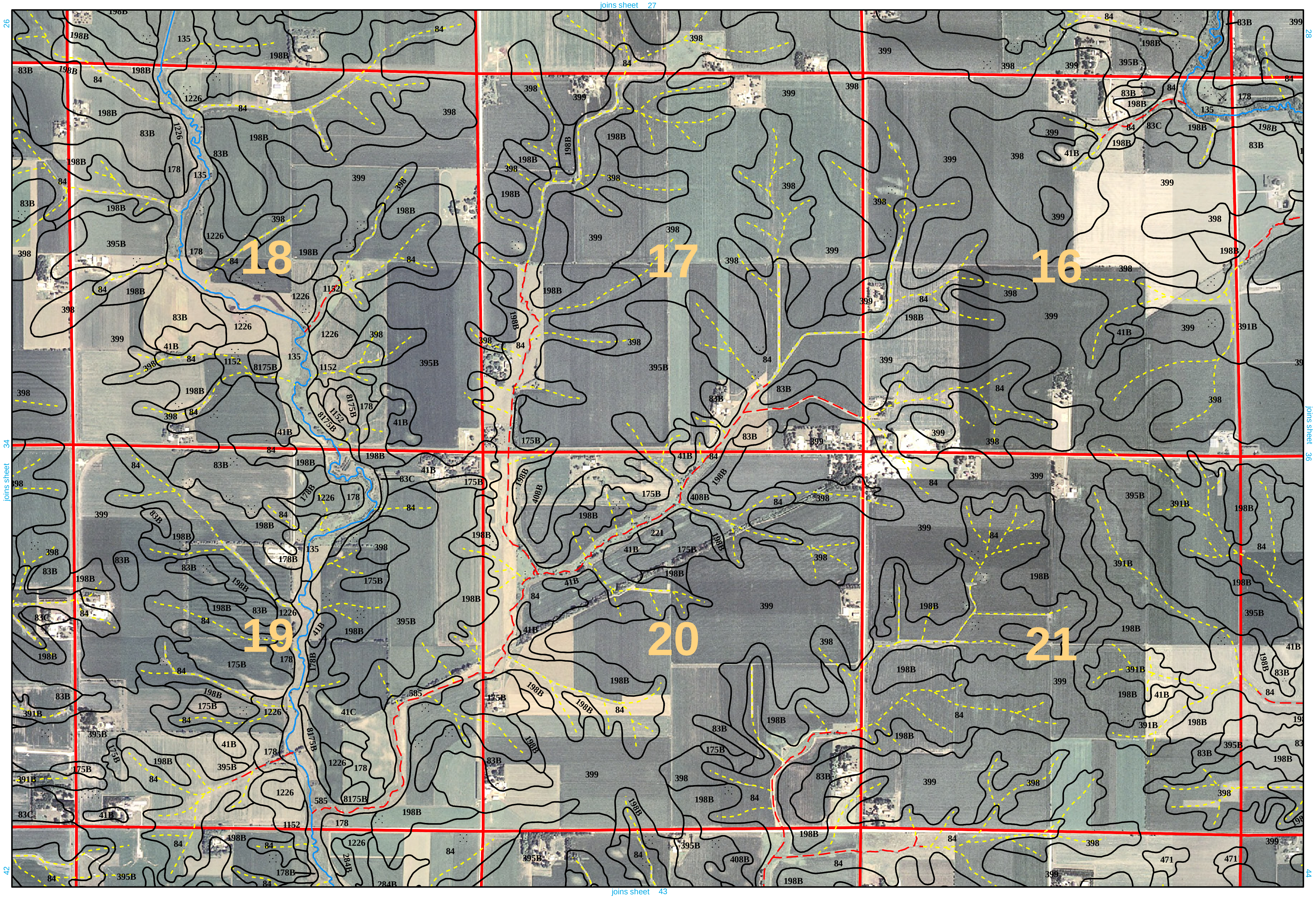

0 1/4 1/2 3/4 1 Miles

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United States Department of Agriculture
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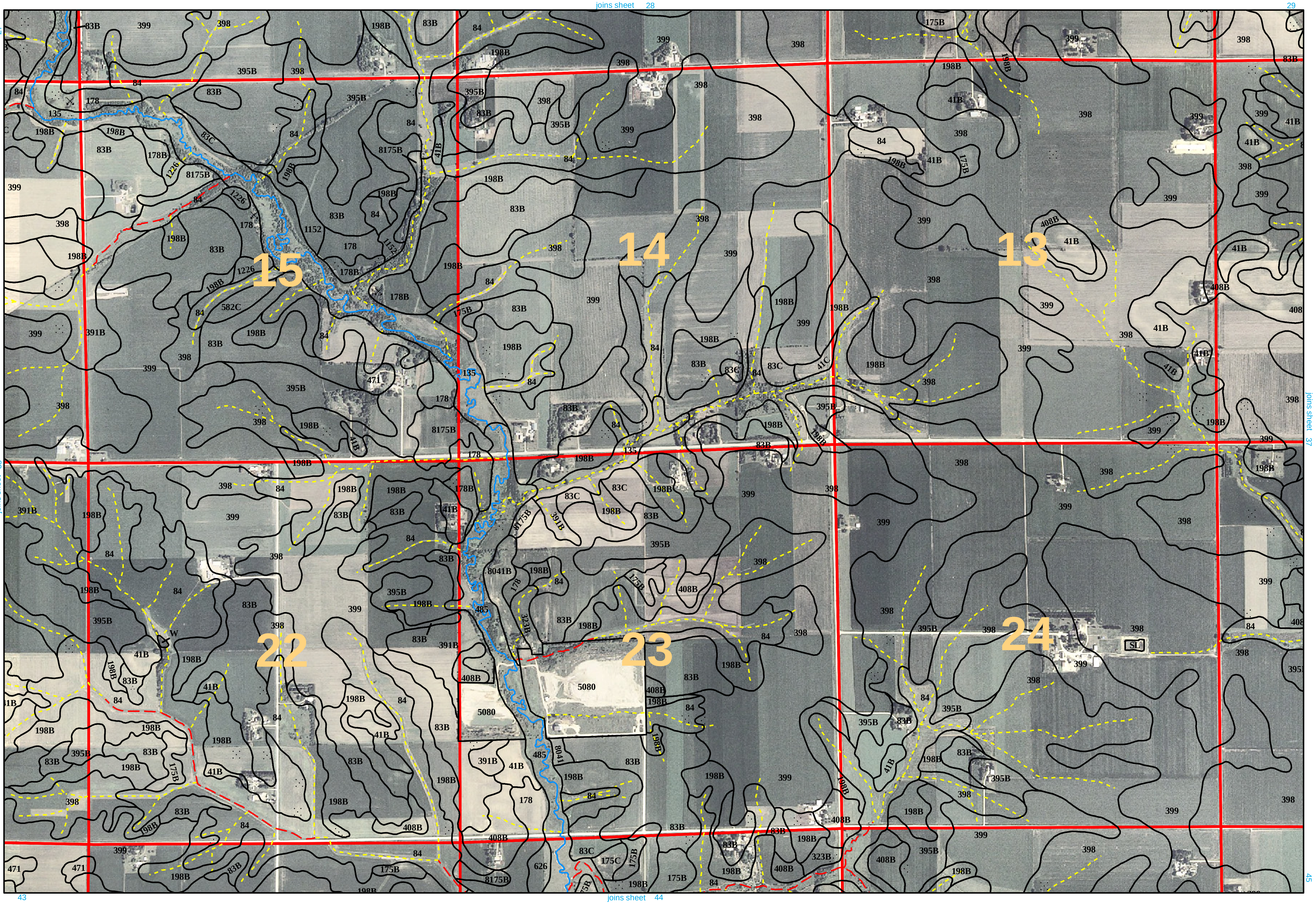
Township 92N Range 13W



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0 1/4 1/2 3/4 1 Miles

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United States Department of Agriculture
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Township 92N Range 12W

37

Soil Survey of Bremer County, Iowa

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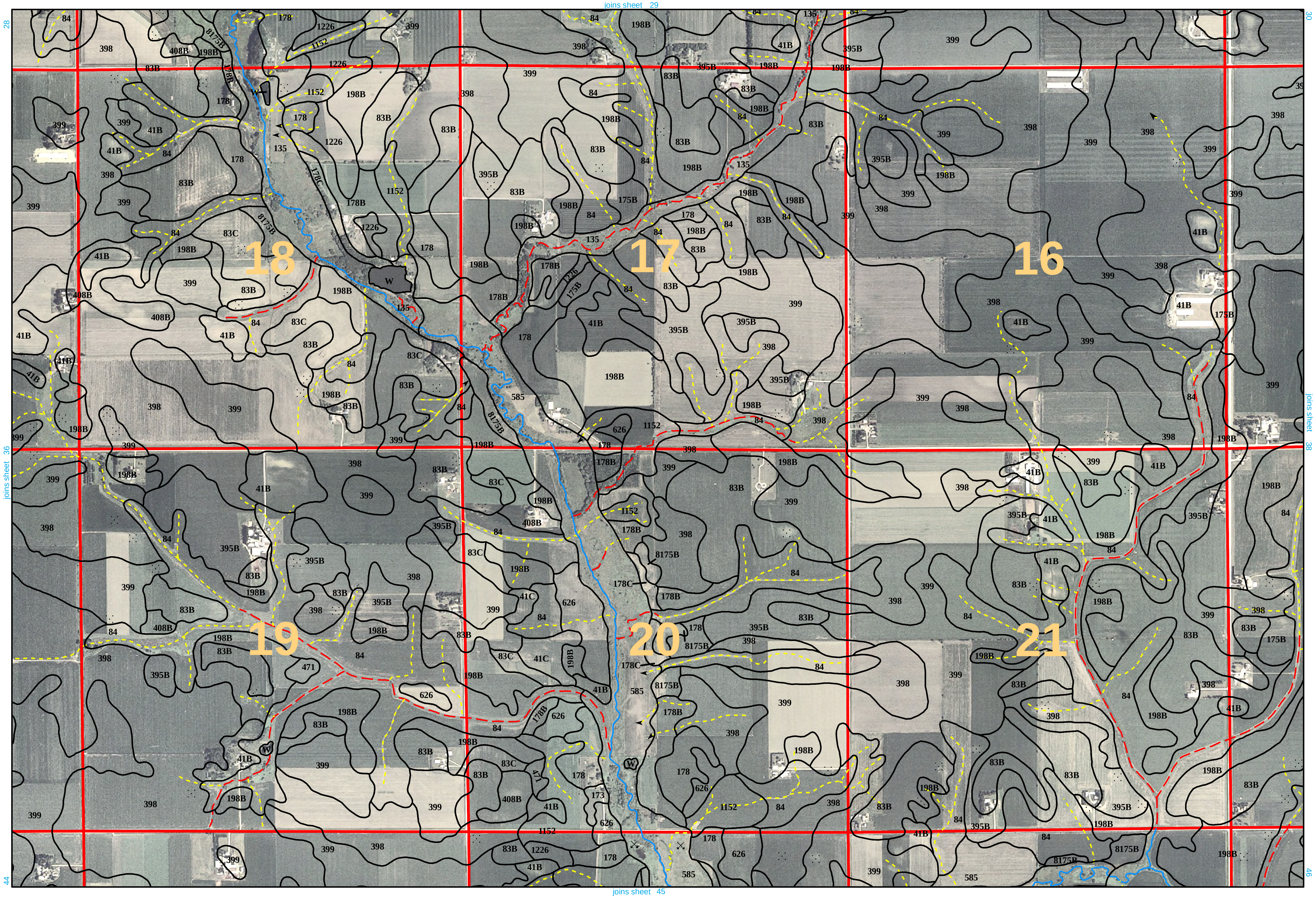

0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

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United States Department of Agriculture
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Township 92N Range 12W

Soil Survey of Bremer County, Iowa

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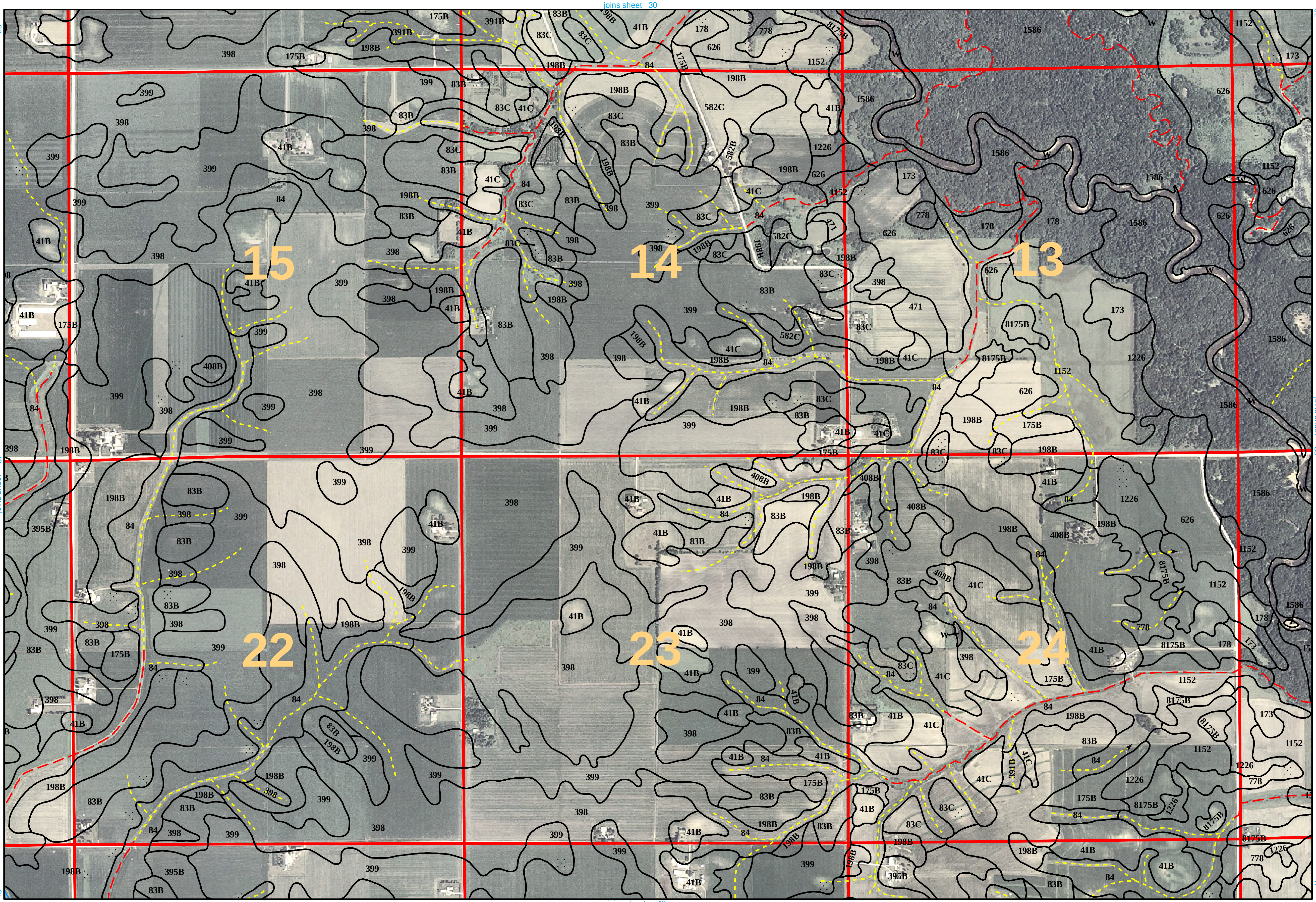

0 1/4 1/2 3/4 1 Miles

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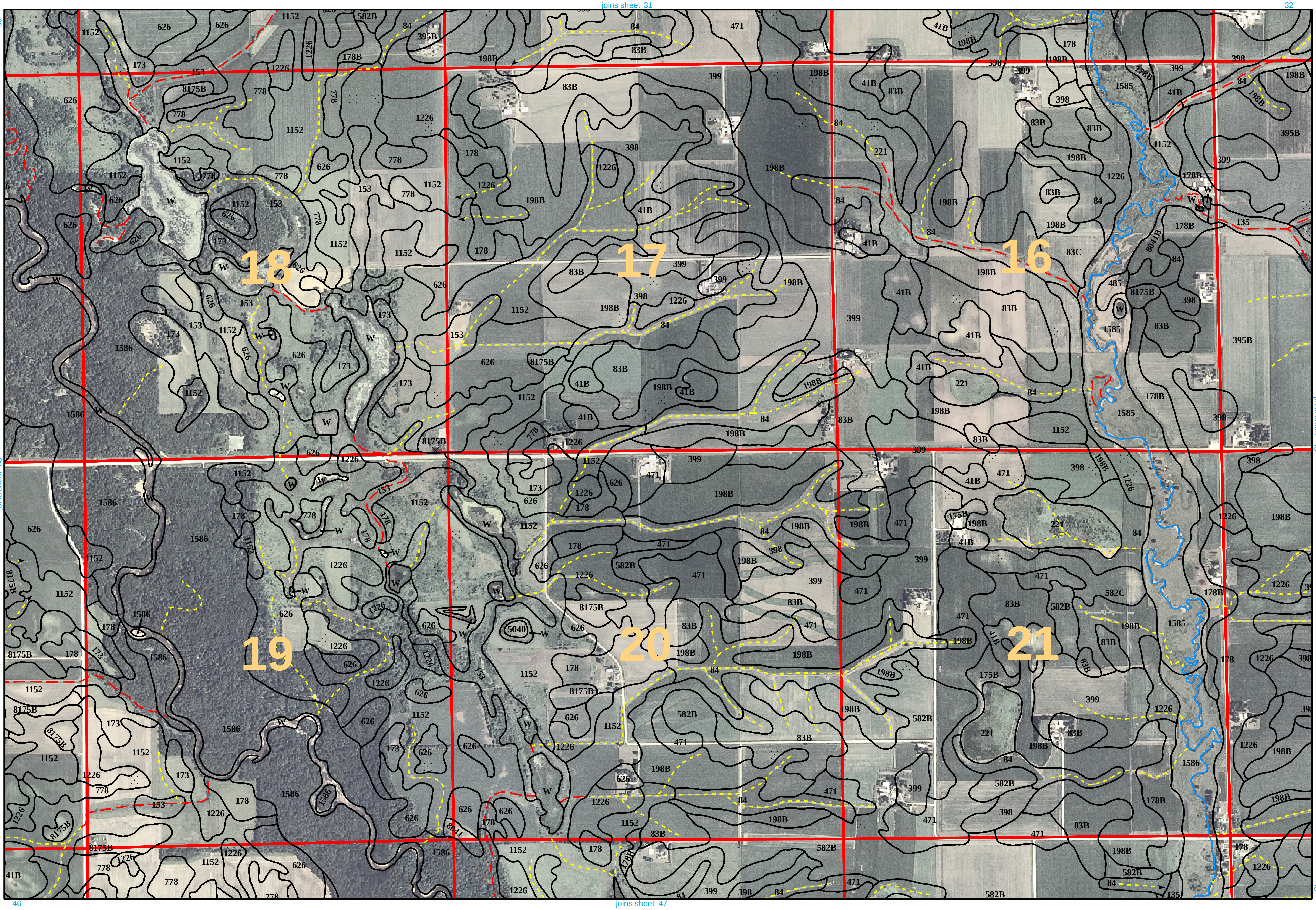
NRCS Natural Resources Conservation Service

39

Township 92N Range 11W

39



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United States Department of Agriculture
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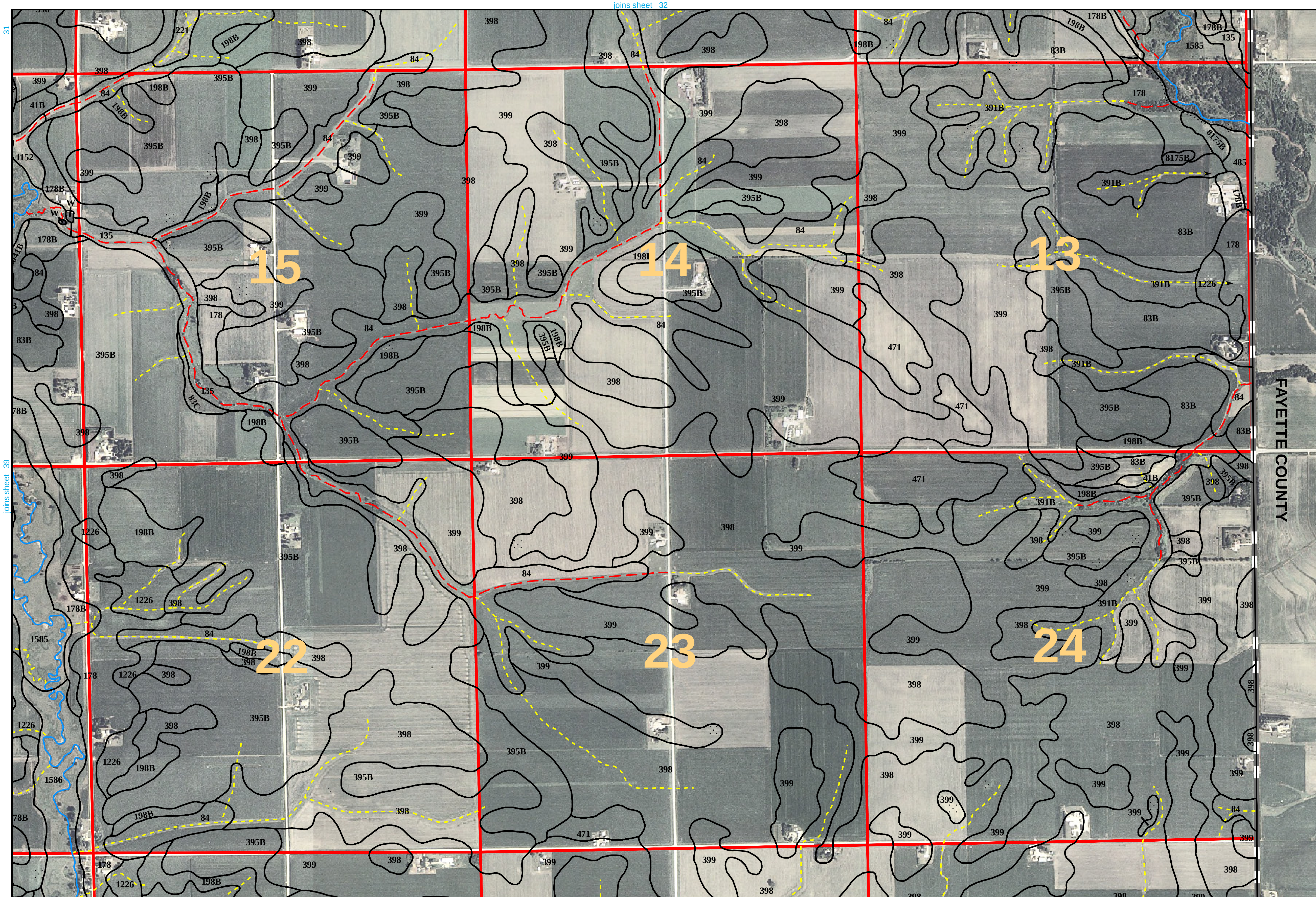
Township 92N Range 11W



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United States Department of Agriculture
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Township 92N Range 14W

41

Soil Survey of Bremer County, Iowa

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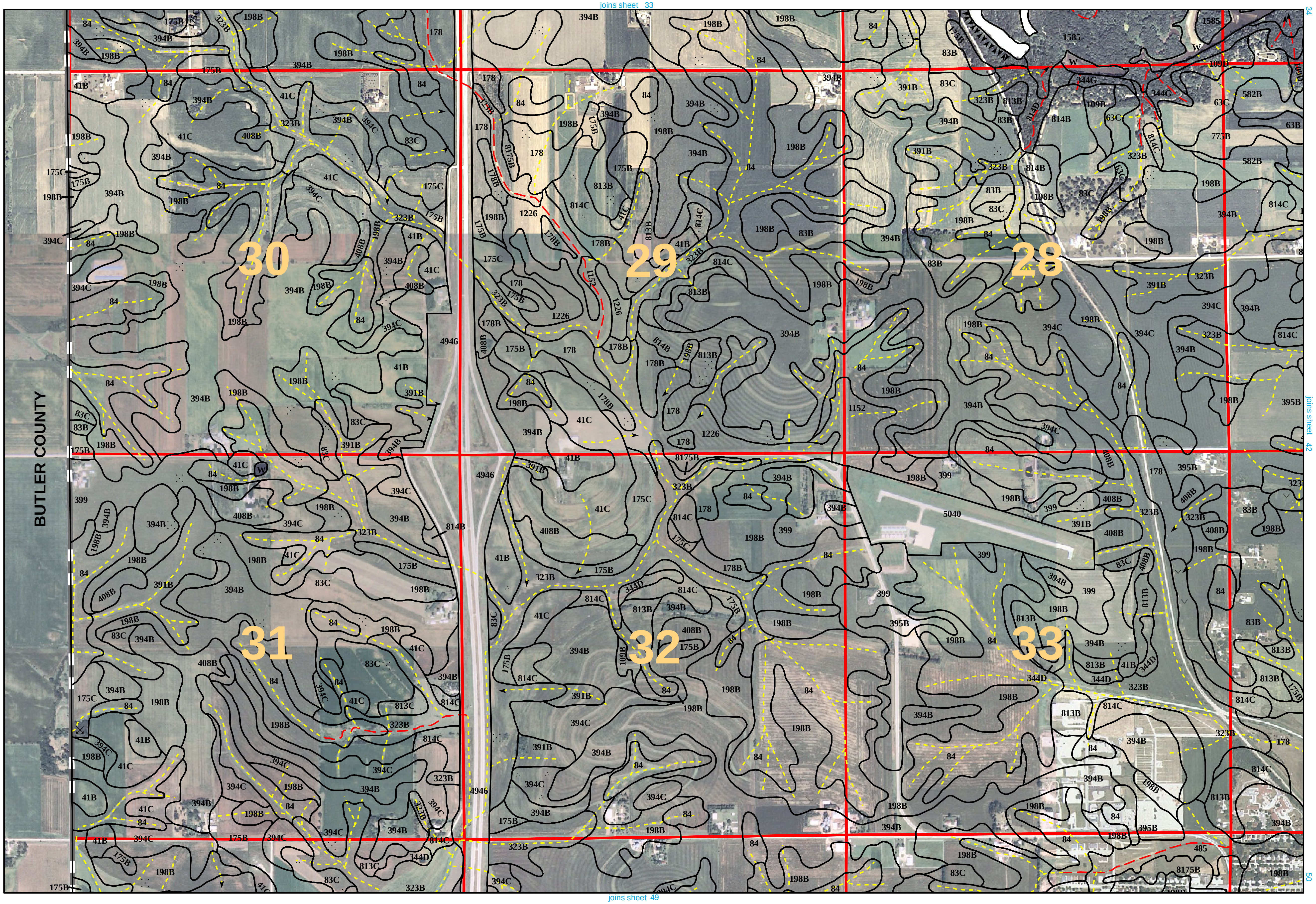

0 1/4 1/2 3/4 1 Miles

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United States Department of Agriculture
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Township 92N Range 14W

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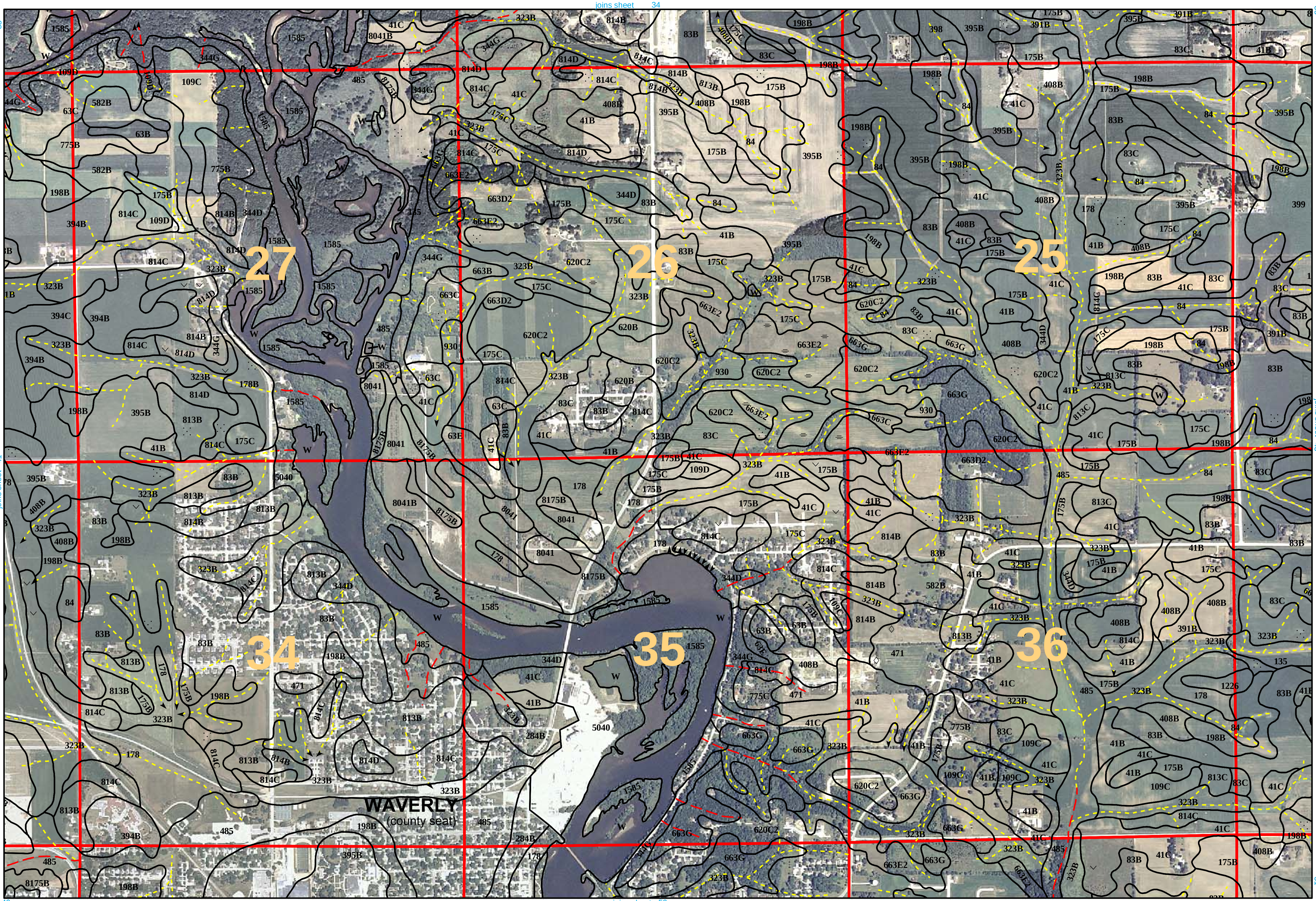

0 1/4 1/2 3/4 1 Miles

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Township 92N Range 13W

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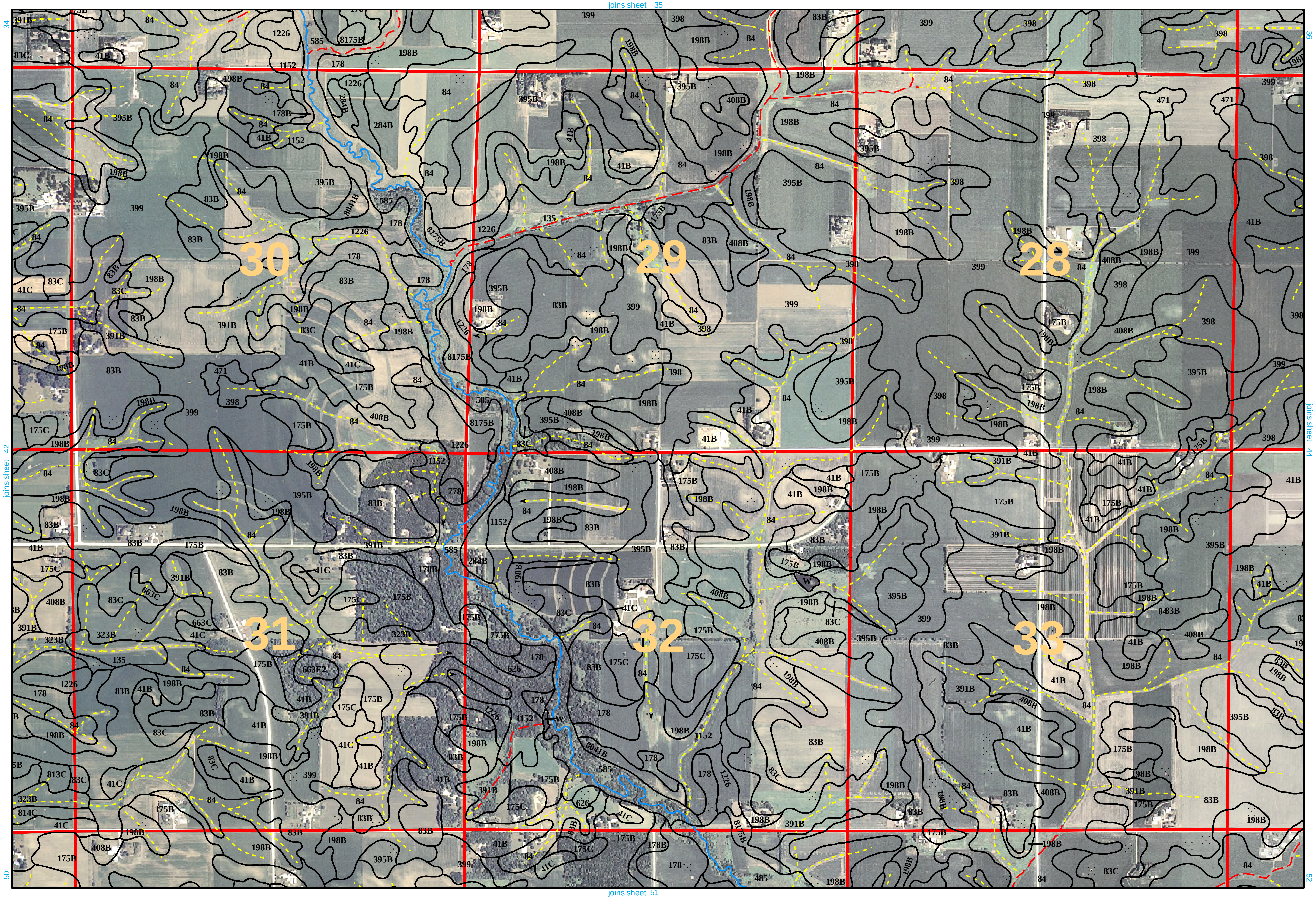

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Township 92N Range 13W

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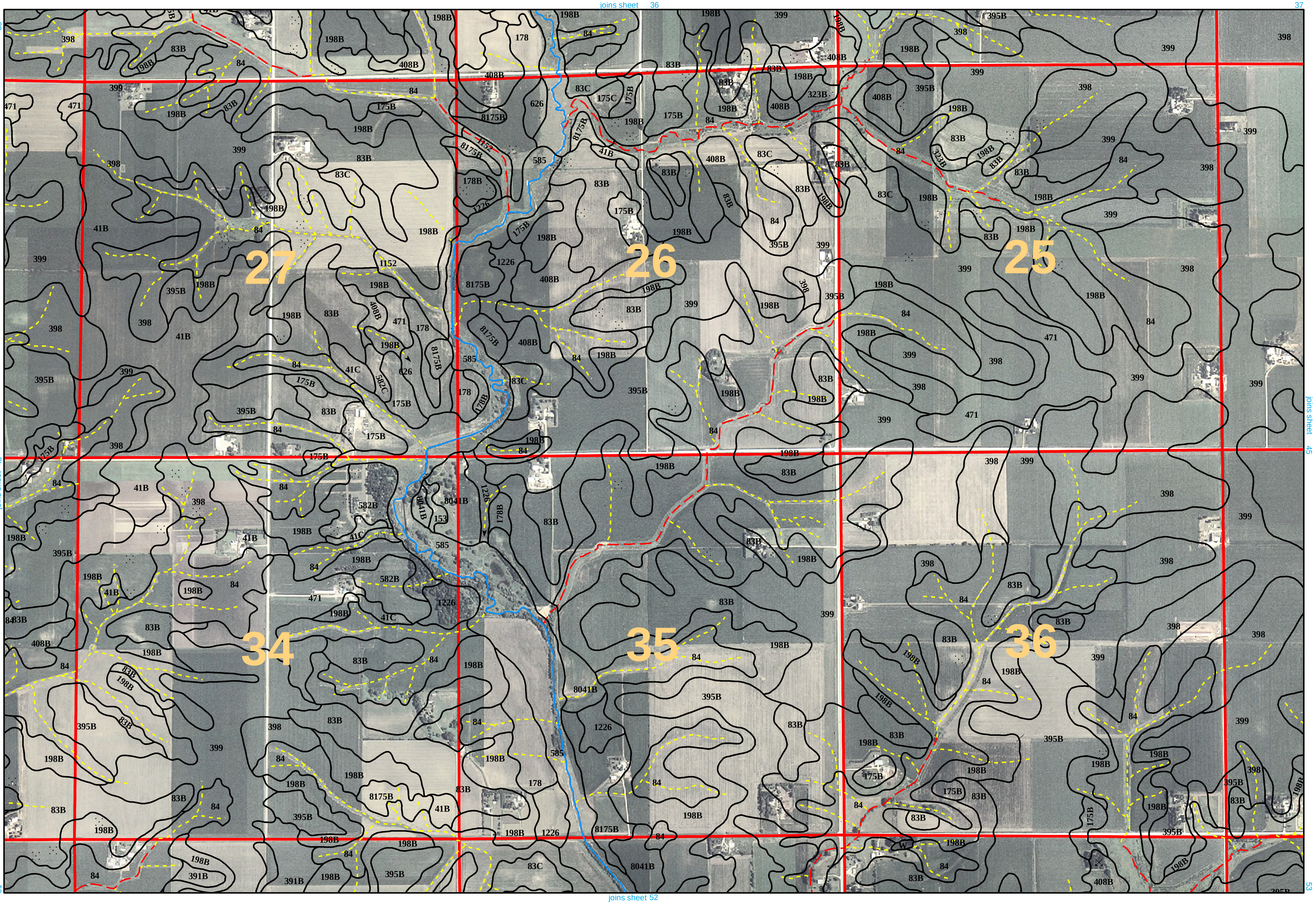

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Township 92N Range 12W

45

Soil Survey of Bremer County, Iowa

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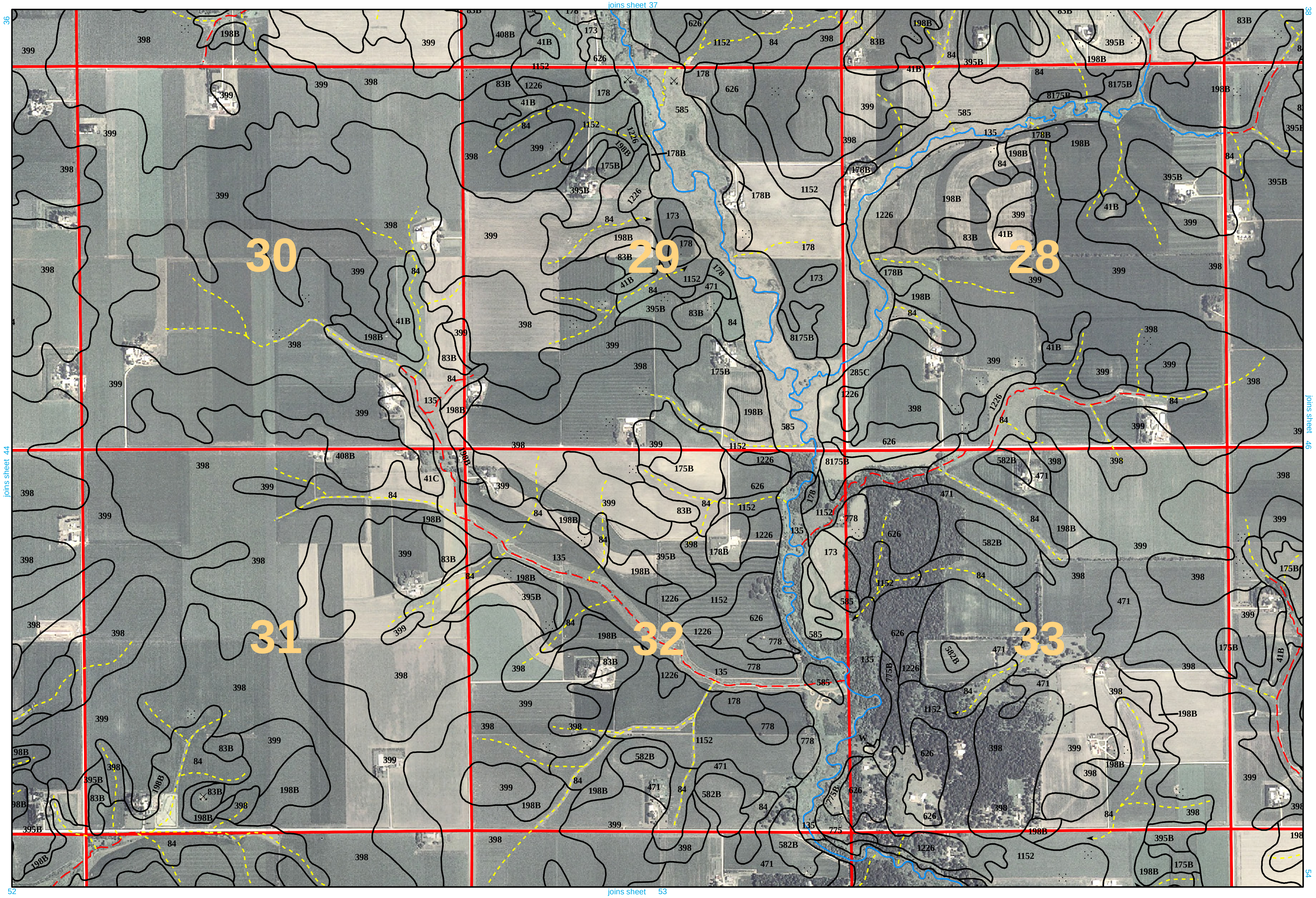
North American Datum of 1983 (NAD83). GRS-80 Spheroid. Universal Transverse Mercator, zone 15.



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United States Department of Agriculture
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Township 92N Range 12W

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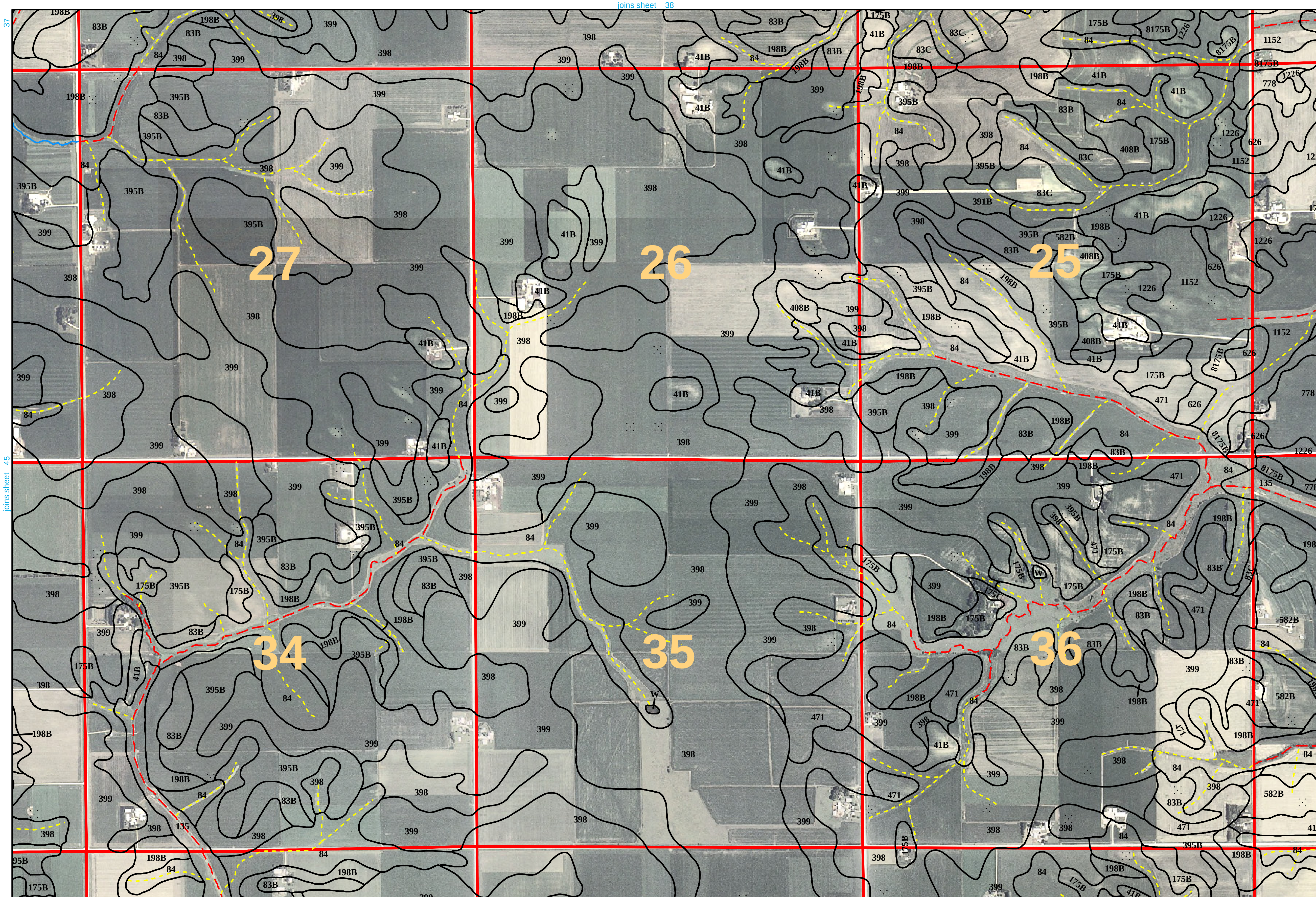

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United States Department of Agriculture
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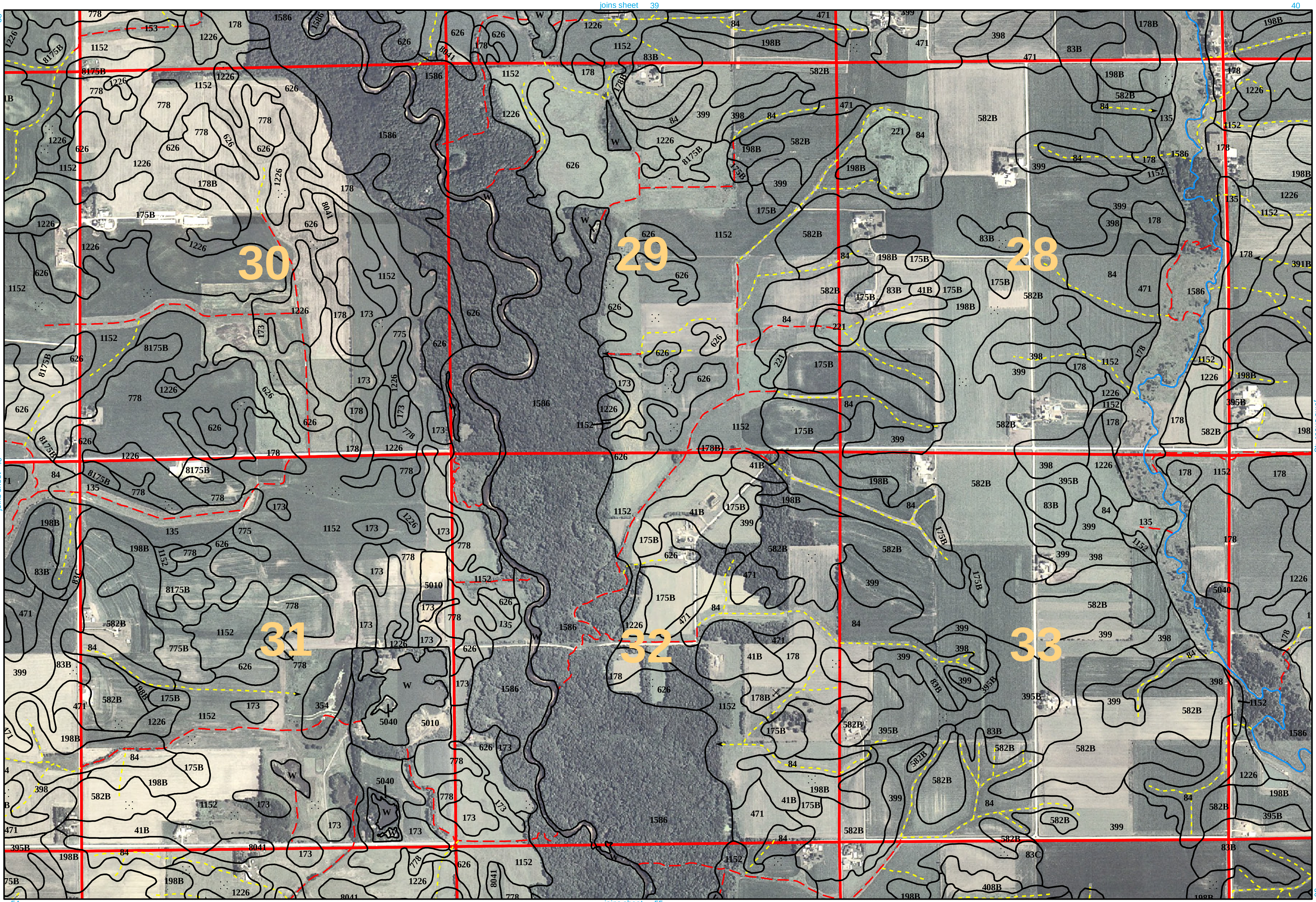
Township 92N Range 11W



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Township 92N Range 11W

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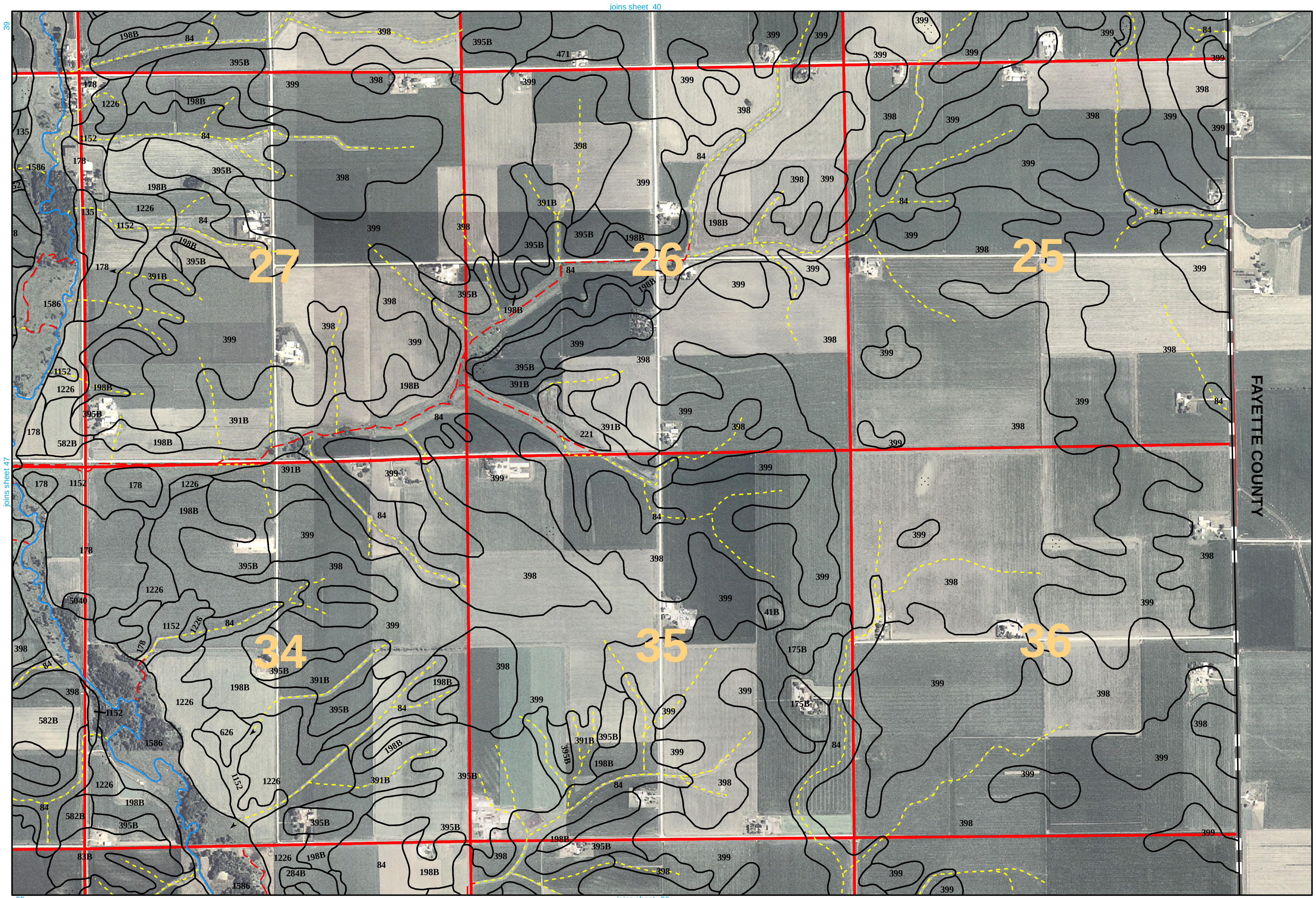

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Township 91N Range 14W

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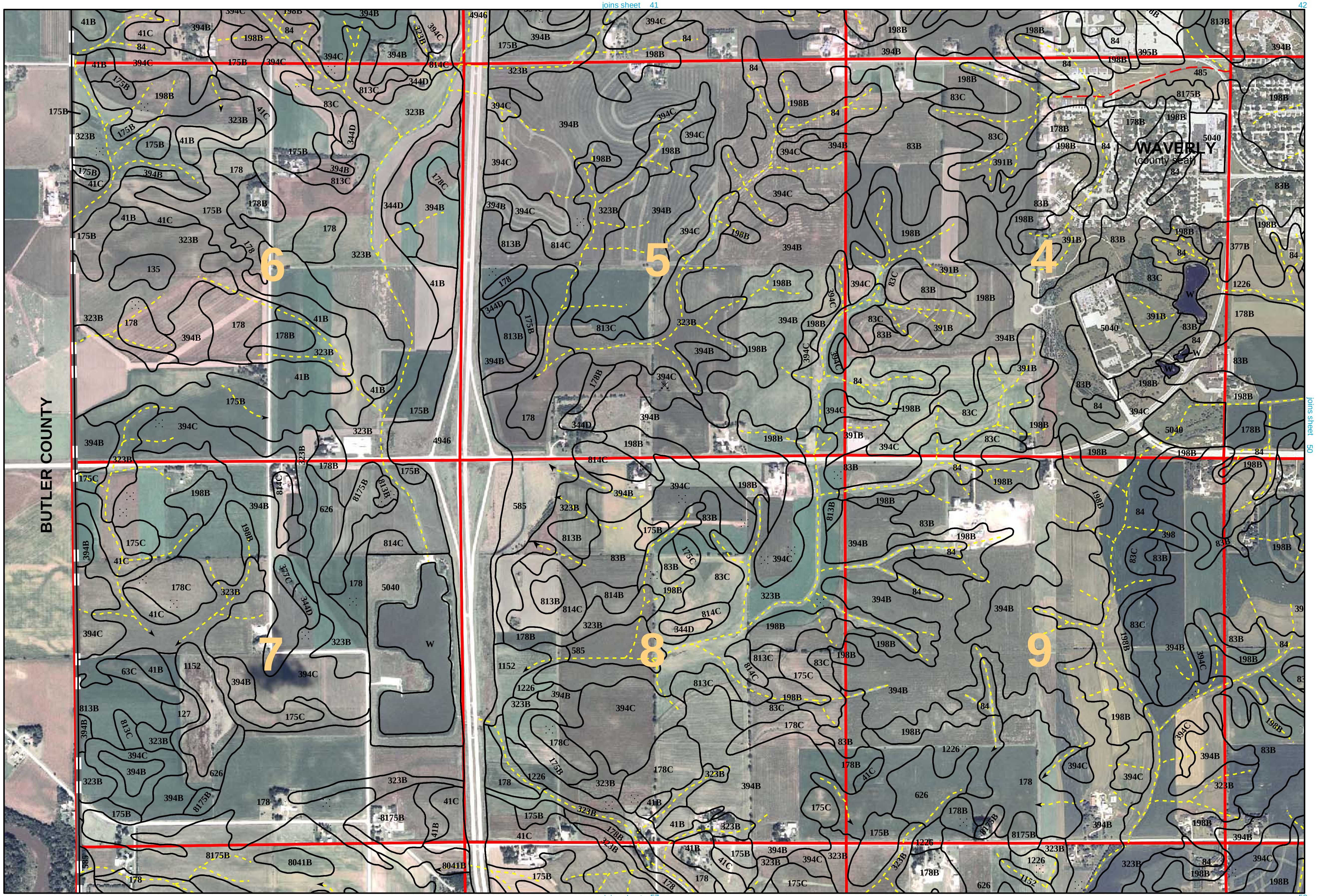

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United States Department of Agriculture
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Township 91N Range 14W

50

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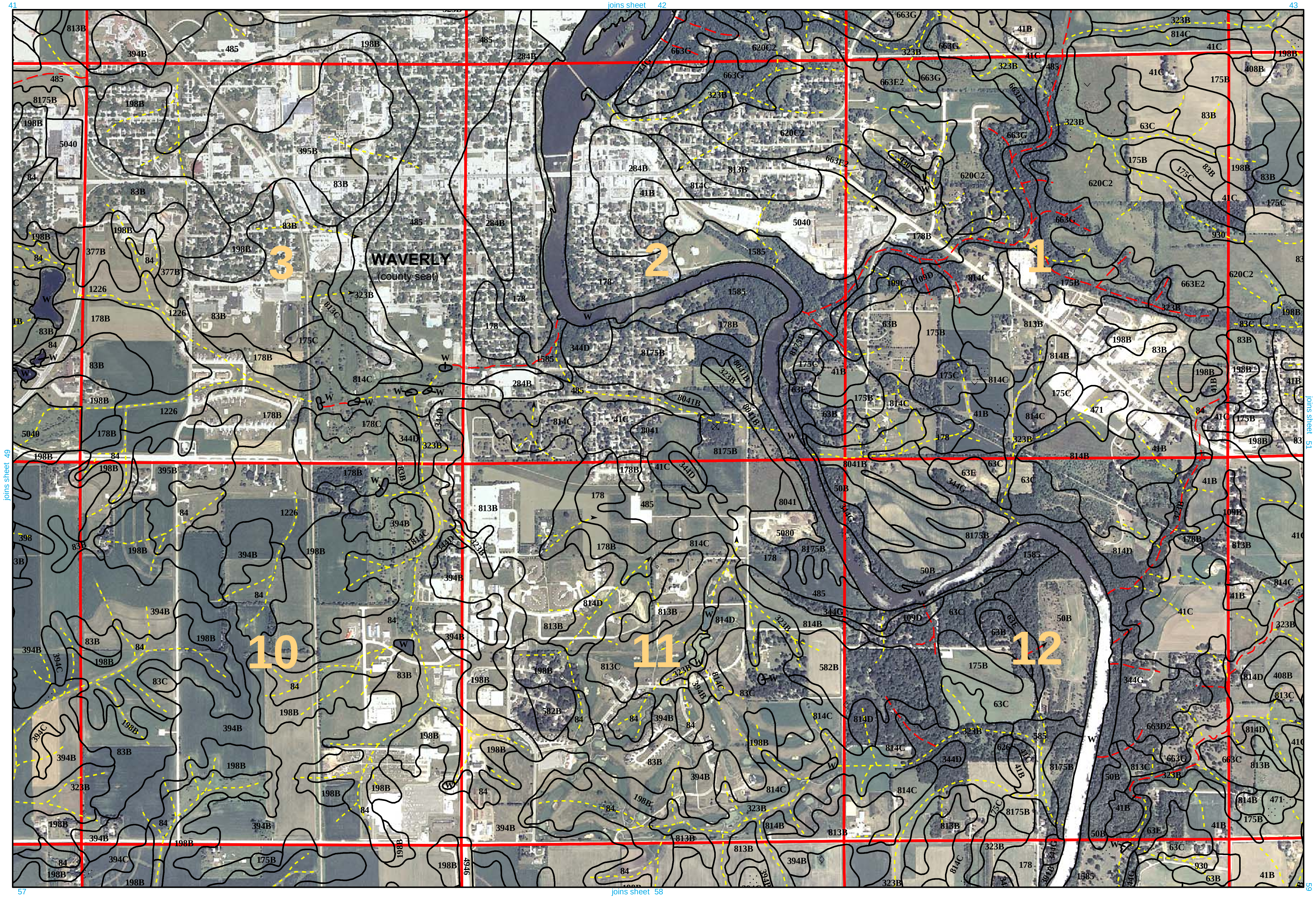

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Township 91N Range 13W

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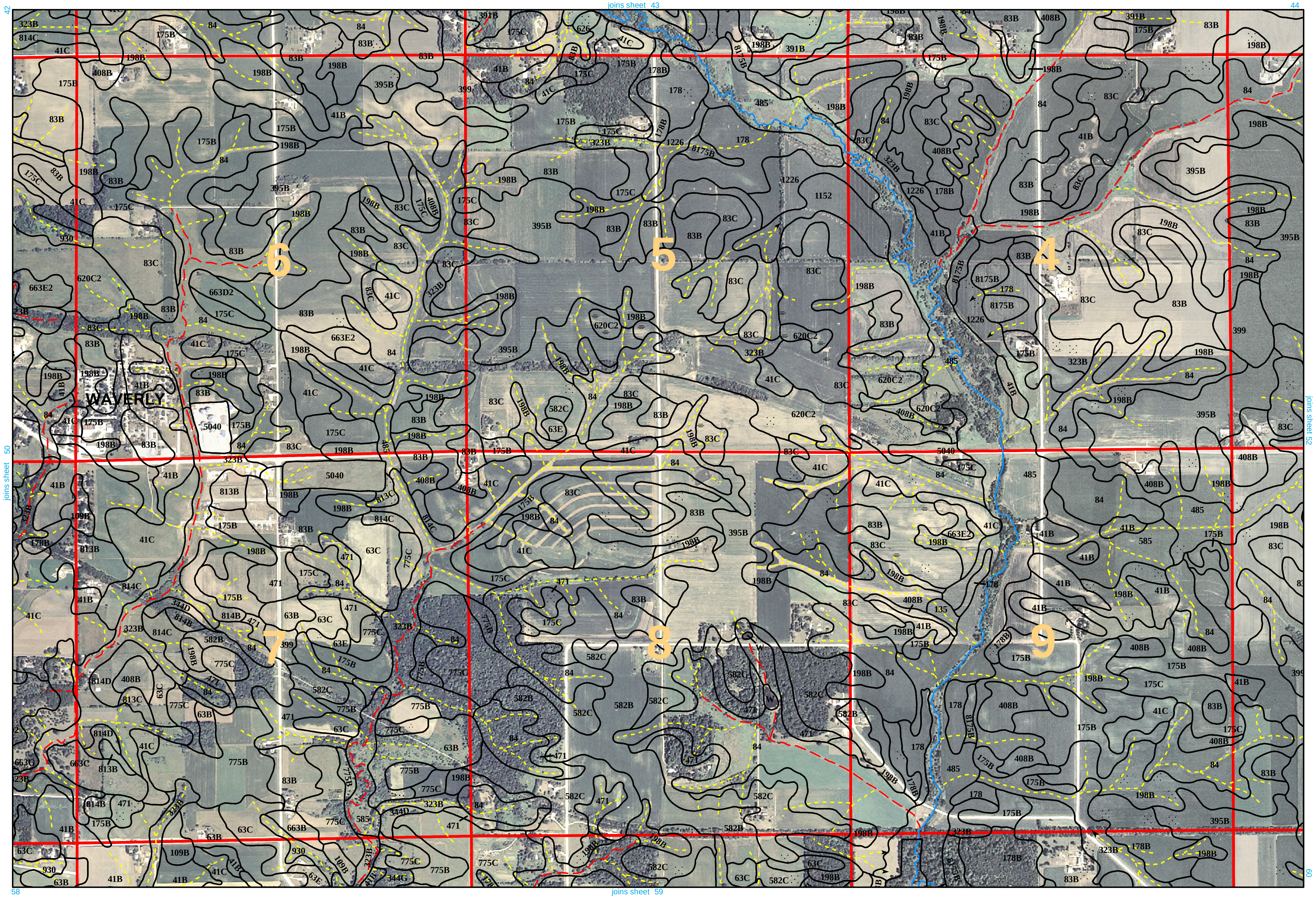

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Township 91N Range 13W

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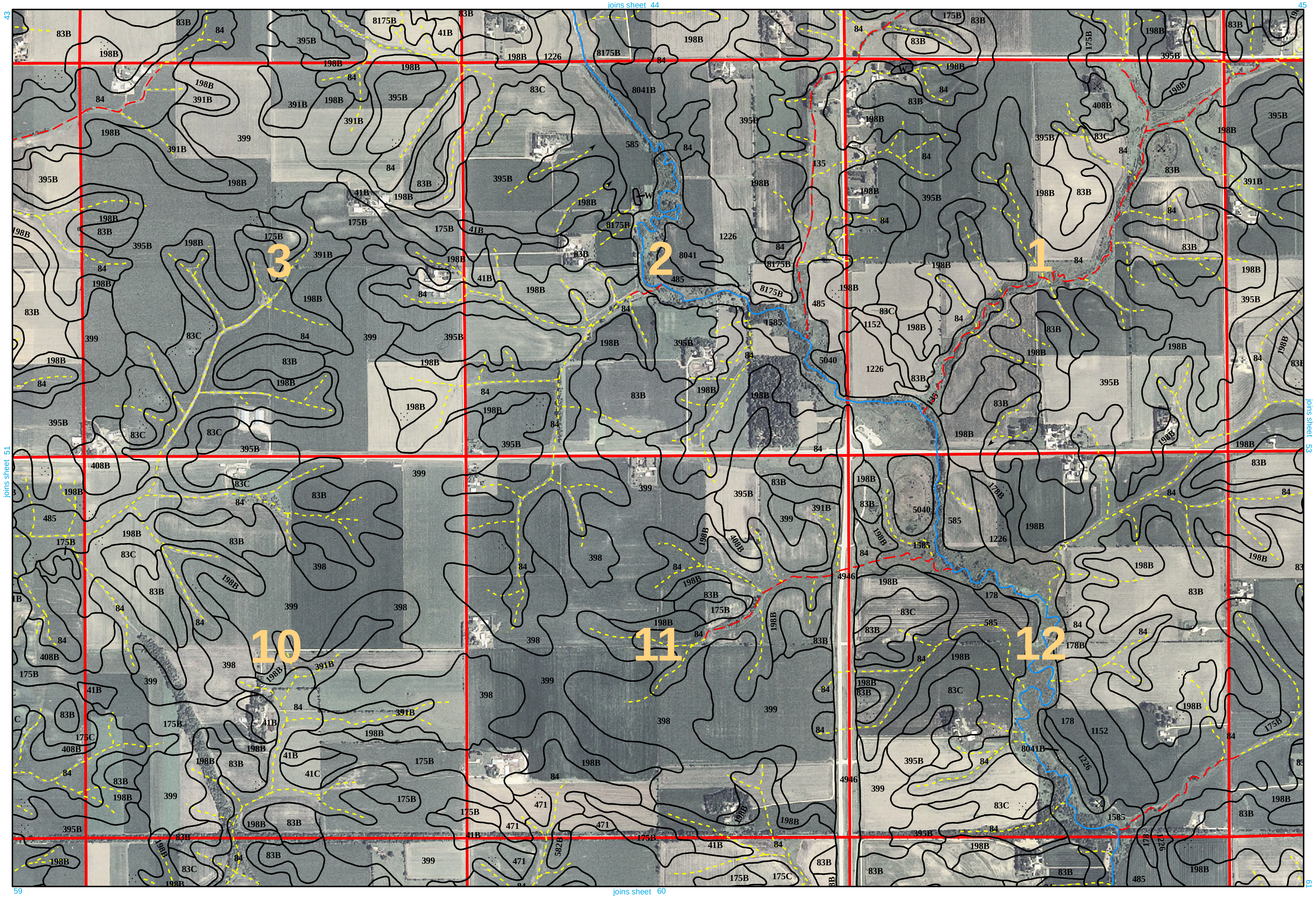

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Township 91N Range 12W

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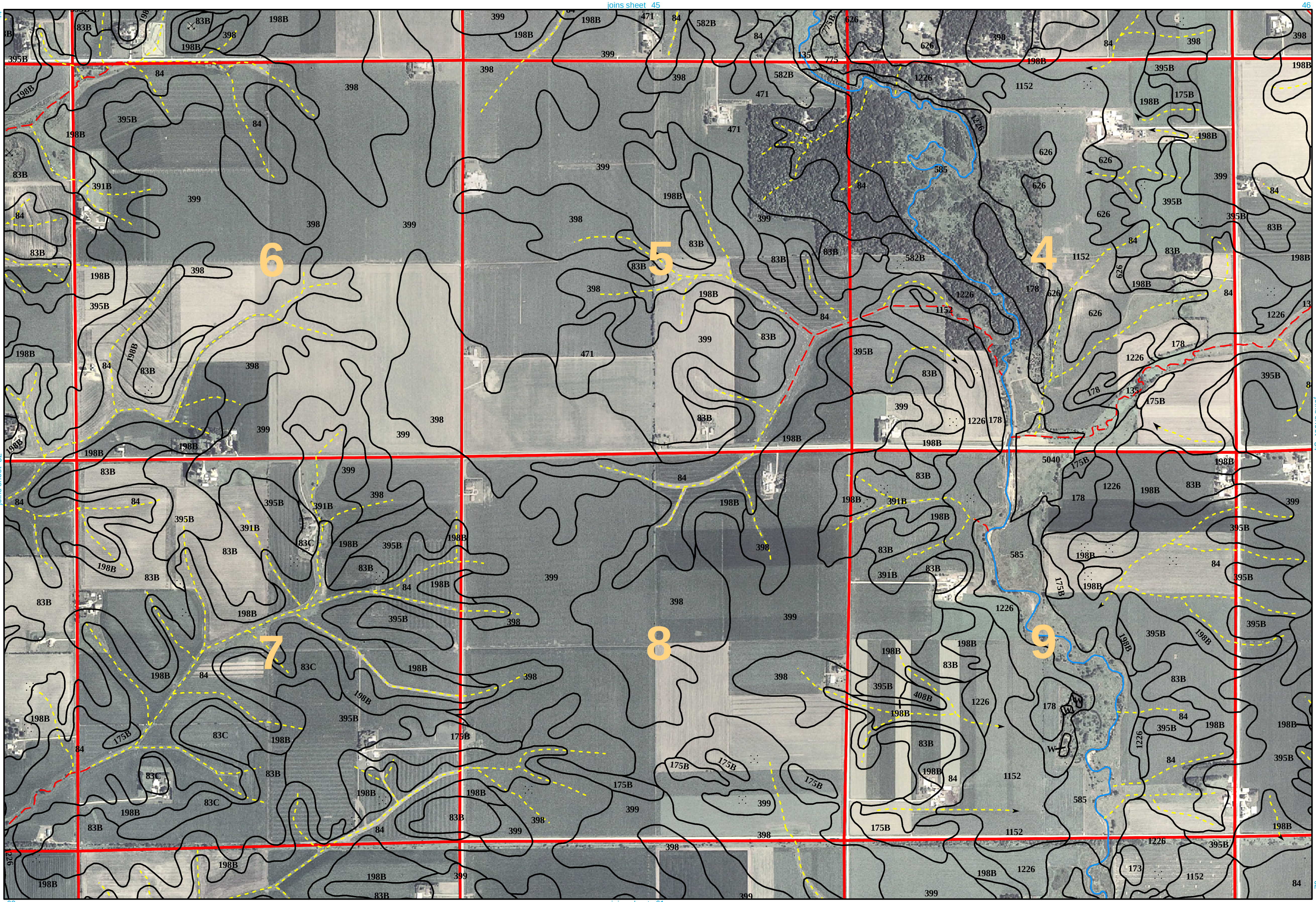

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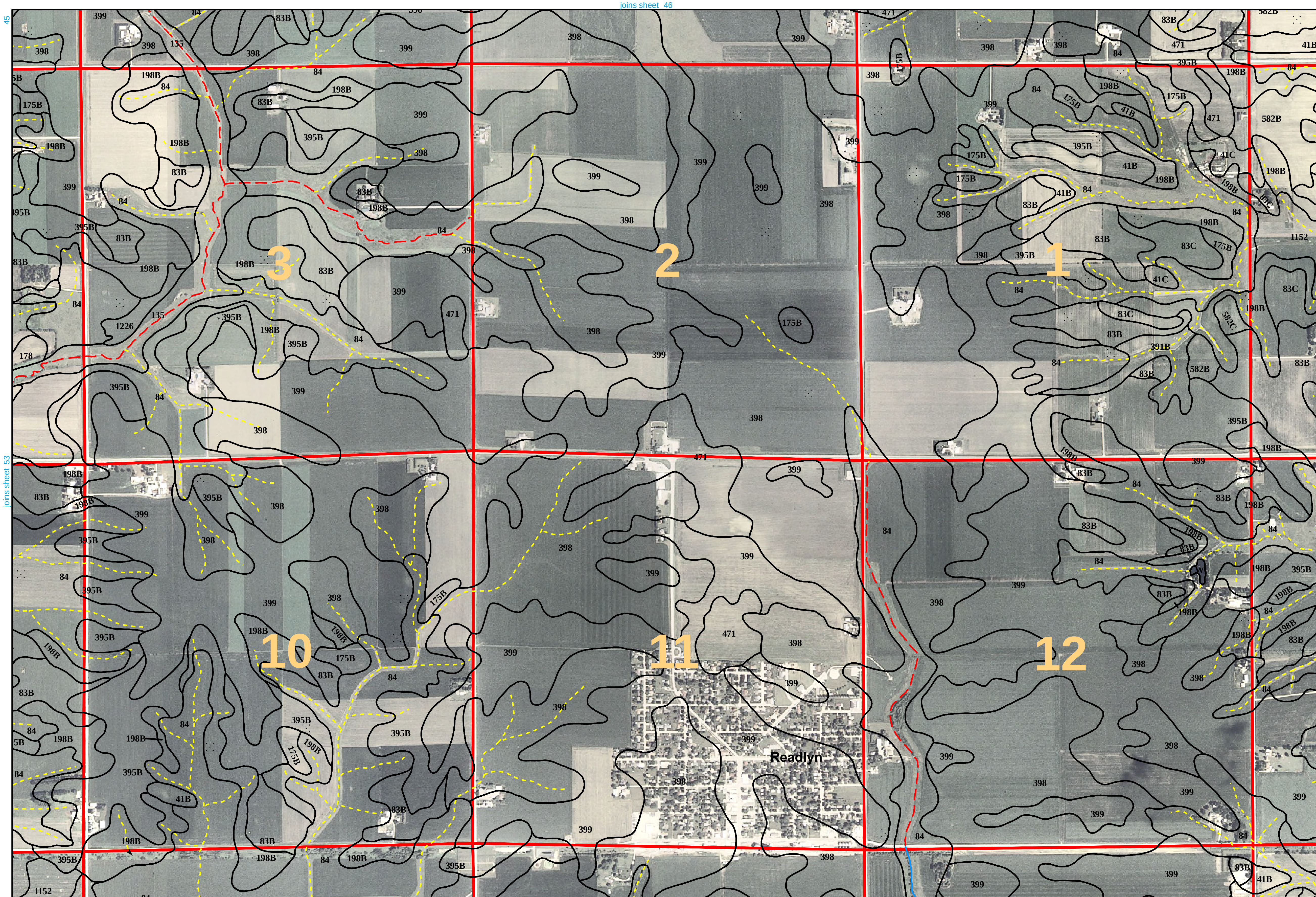
Township 91N Range 12W

54



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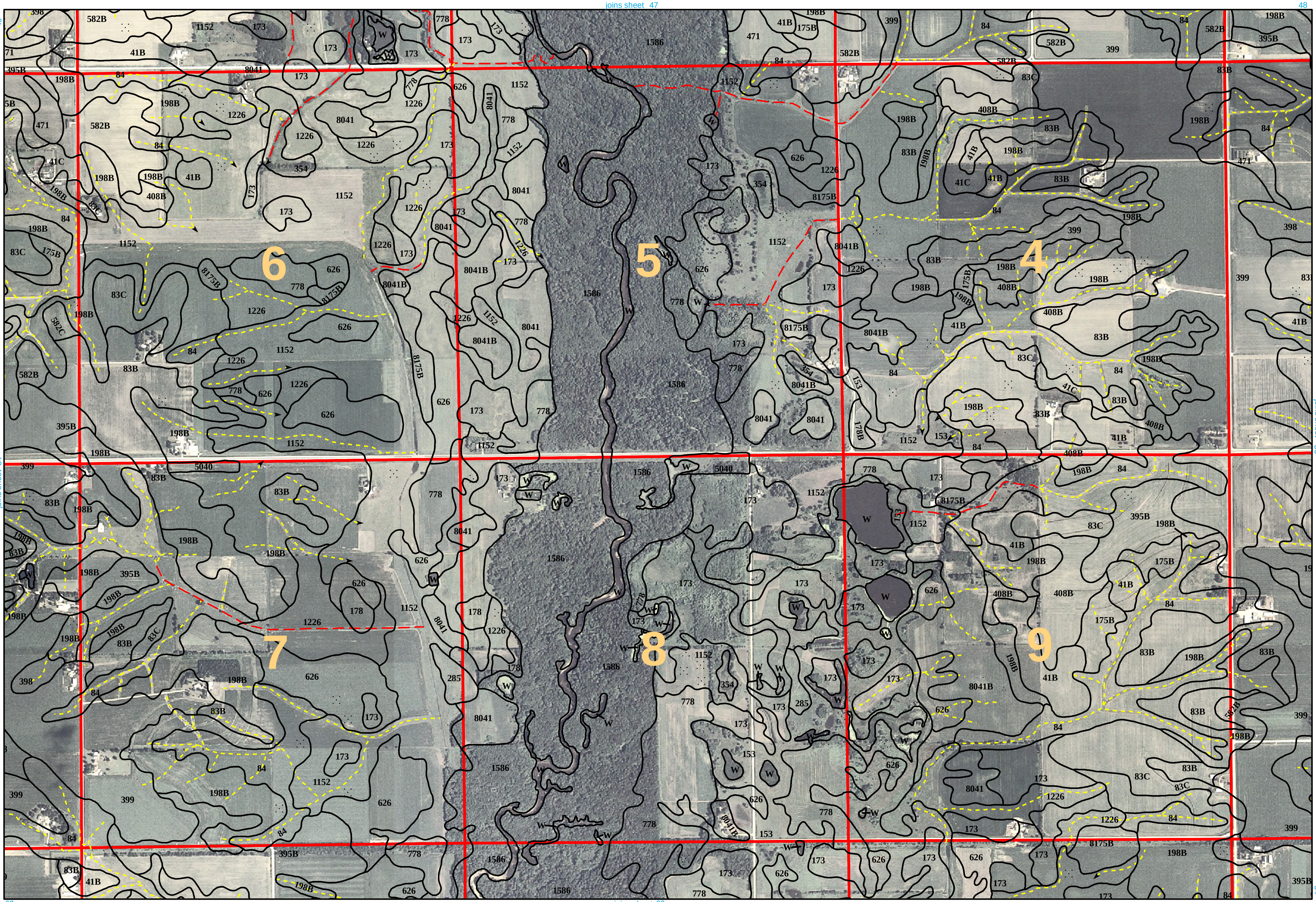
Township 91N Range 11W

55



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Township 91N Range 11W

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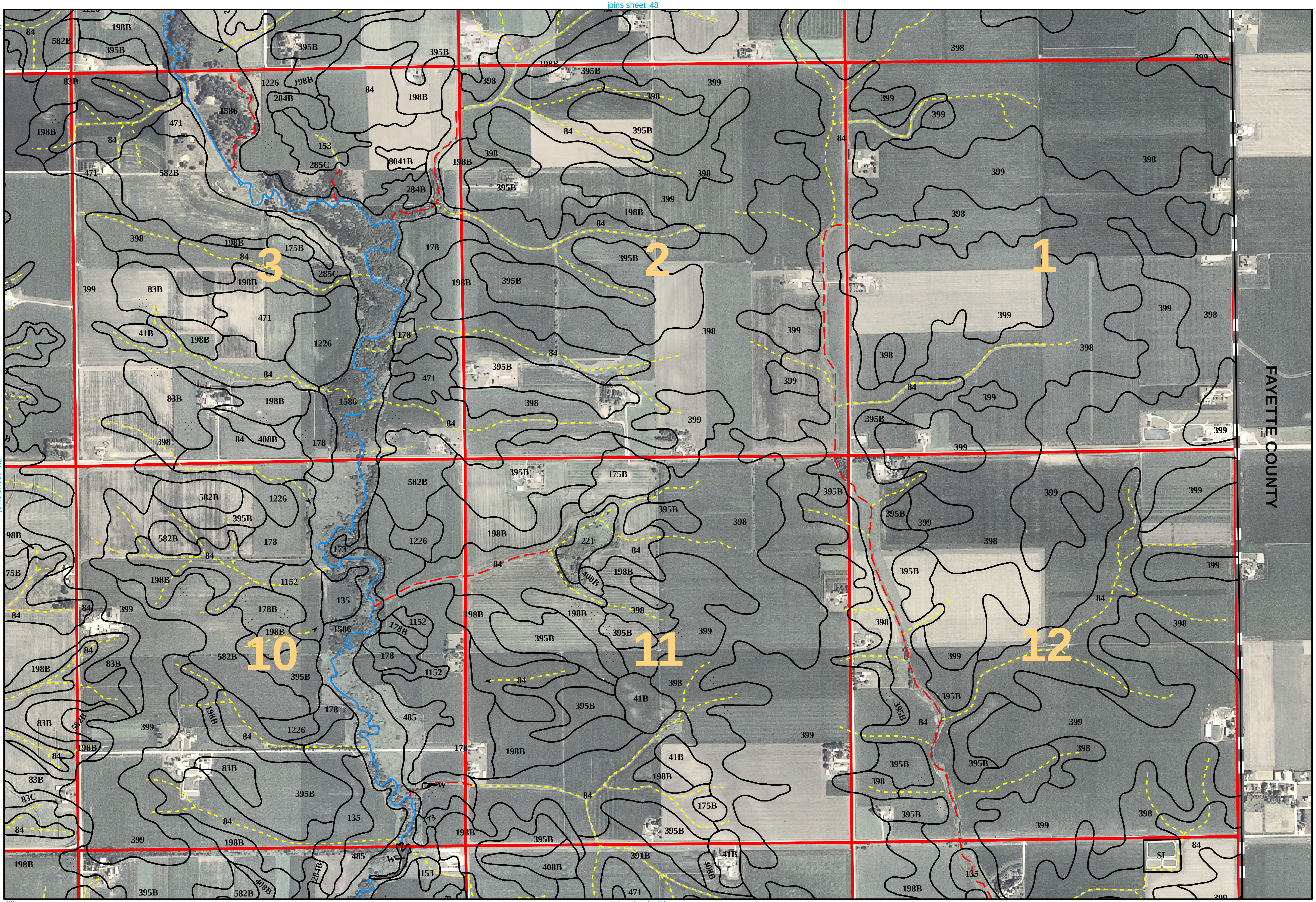

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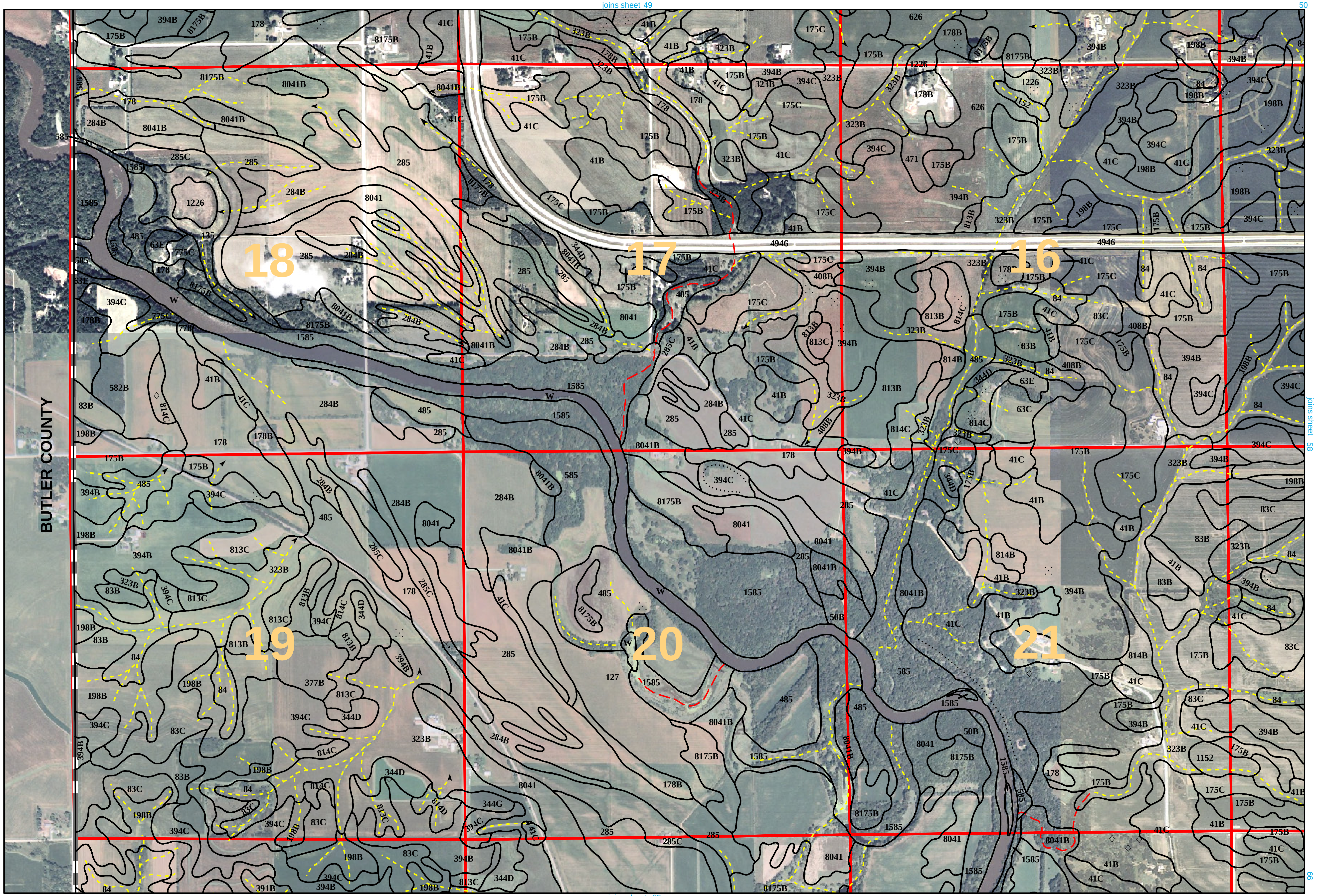
Township 91N Range 14W



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Township 91N Range 14W

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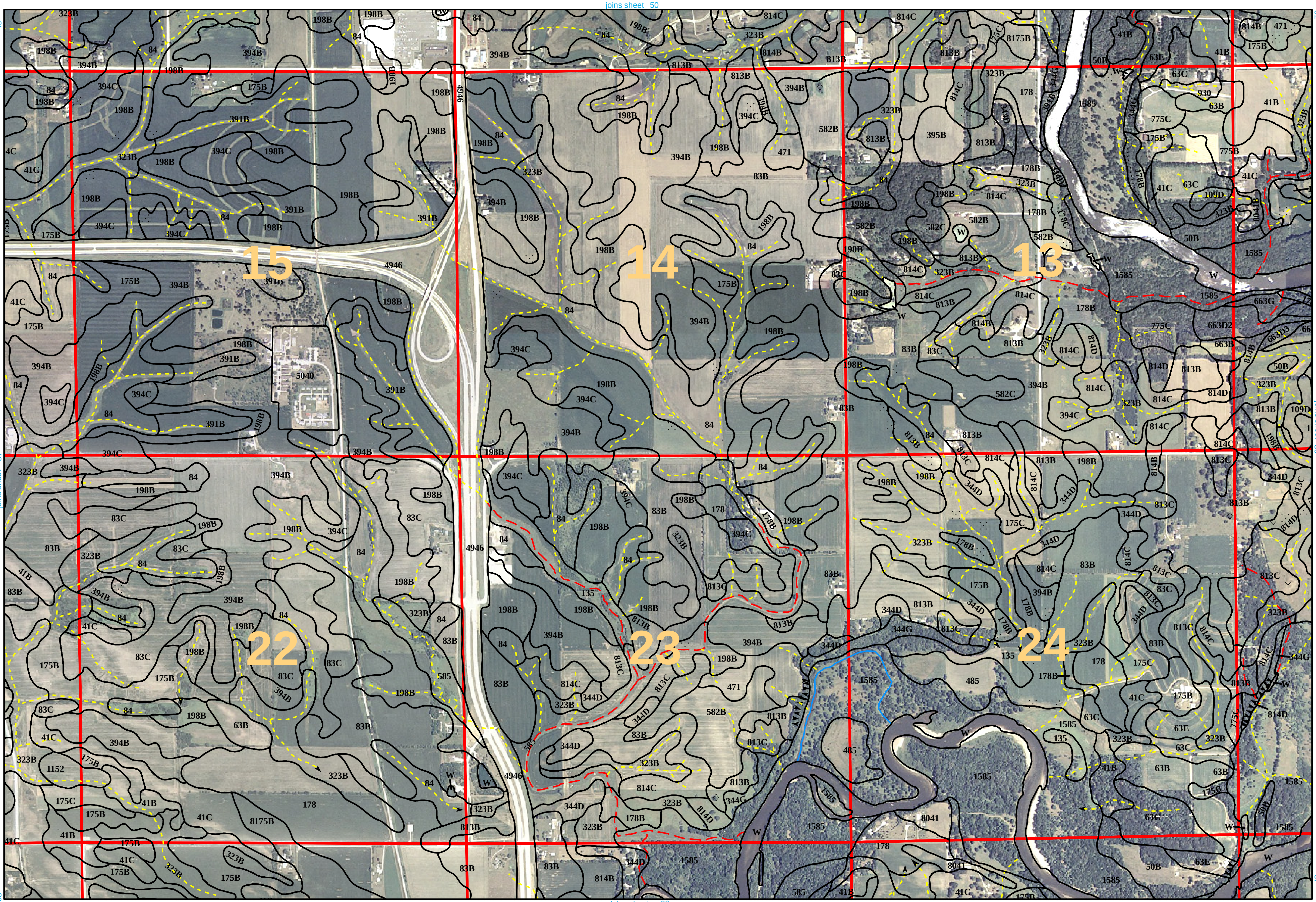

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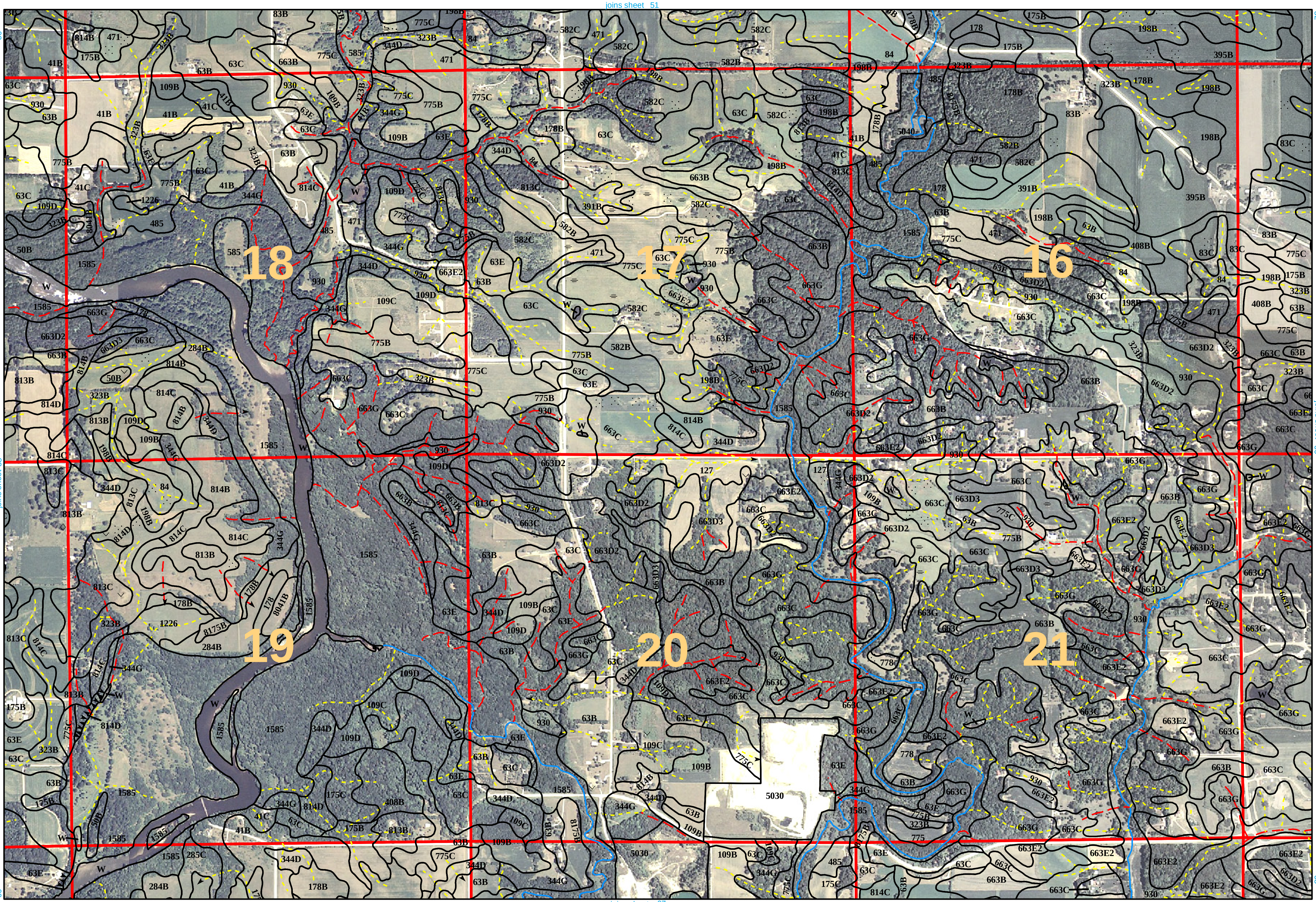
Township 91N Range 13W



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Township 91N Range 13W

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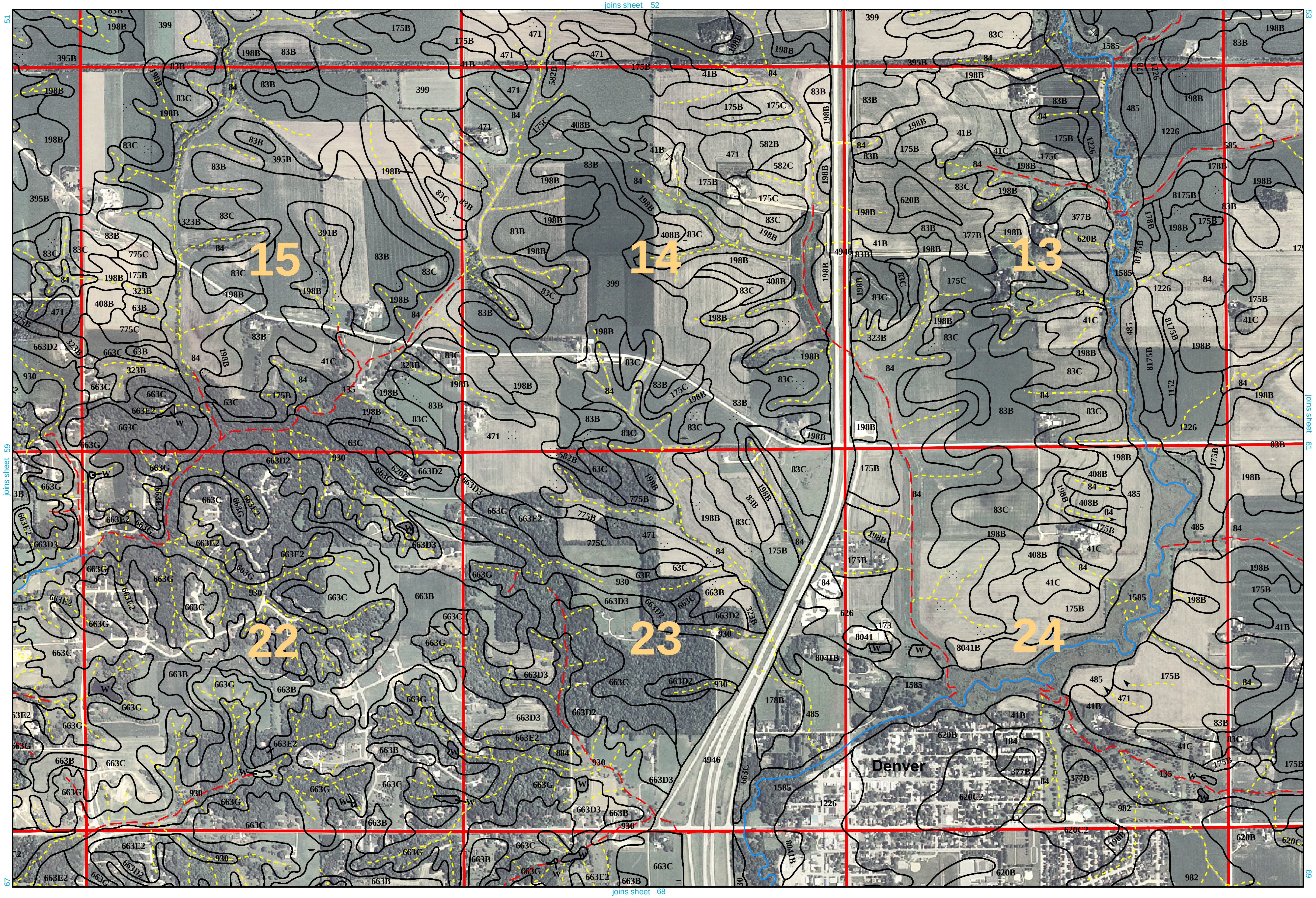

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United States Department of Agriculture
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Township 91N Range 12W

61

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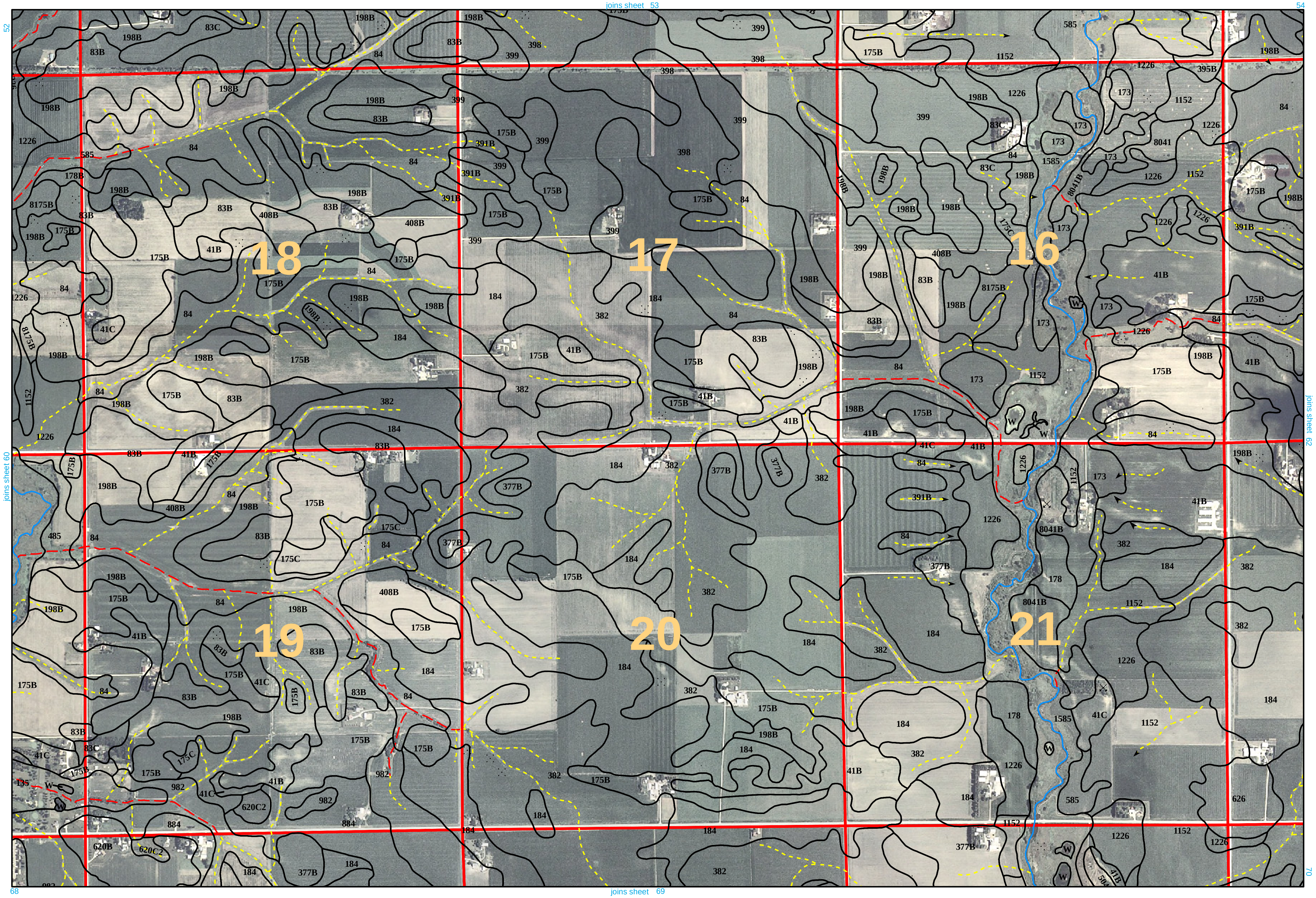

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United States Department of Agriculture
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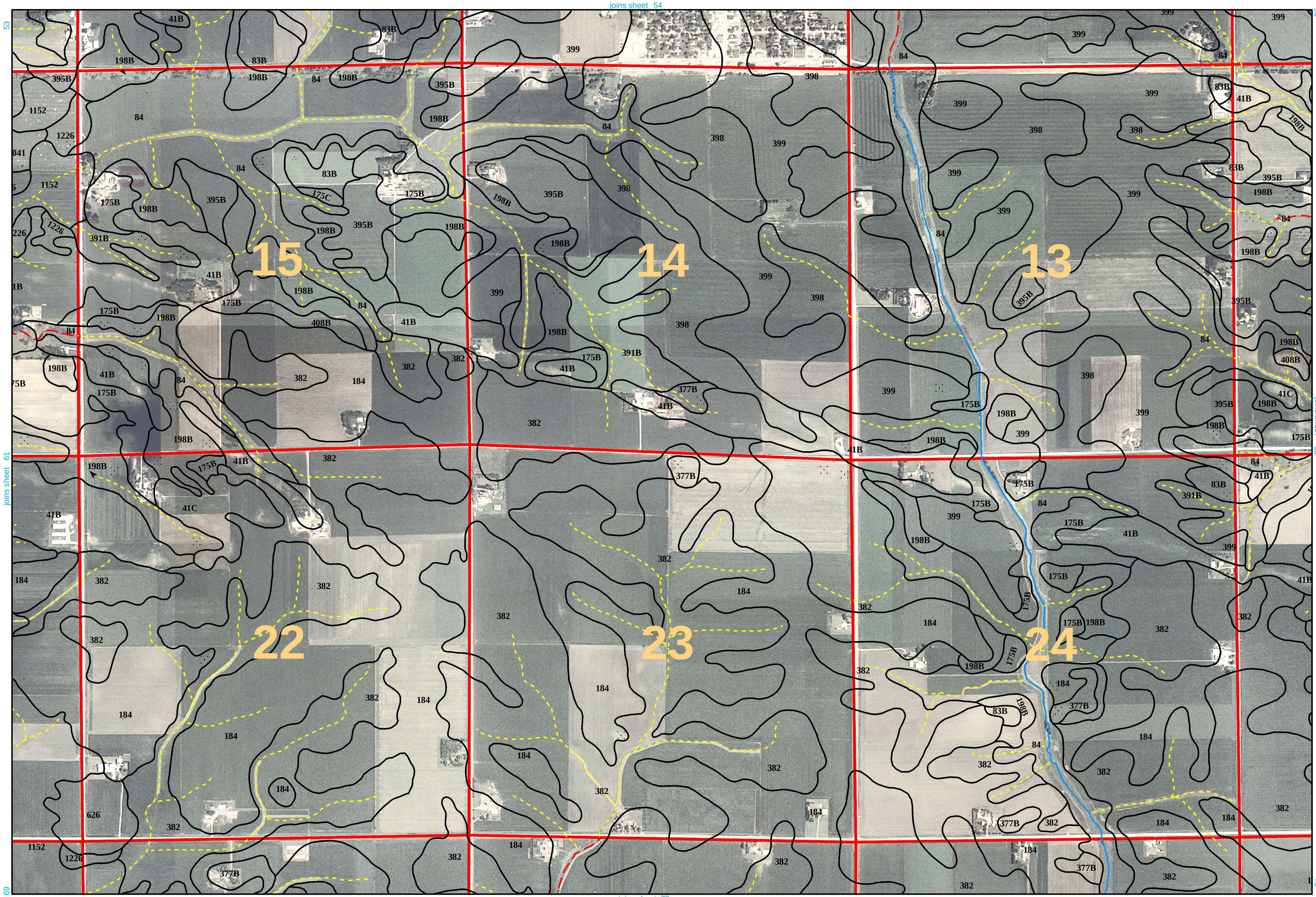
Township 91N Range 12W

62



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0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

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United States Department of Agriculture
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Township 91N Range 11W

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North American Datum of 1983 (NAD83). GRS-80 Spheroid. Universal Transverse Mercator, zone 15.

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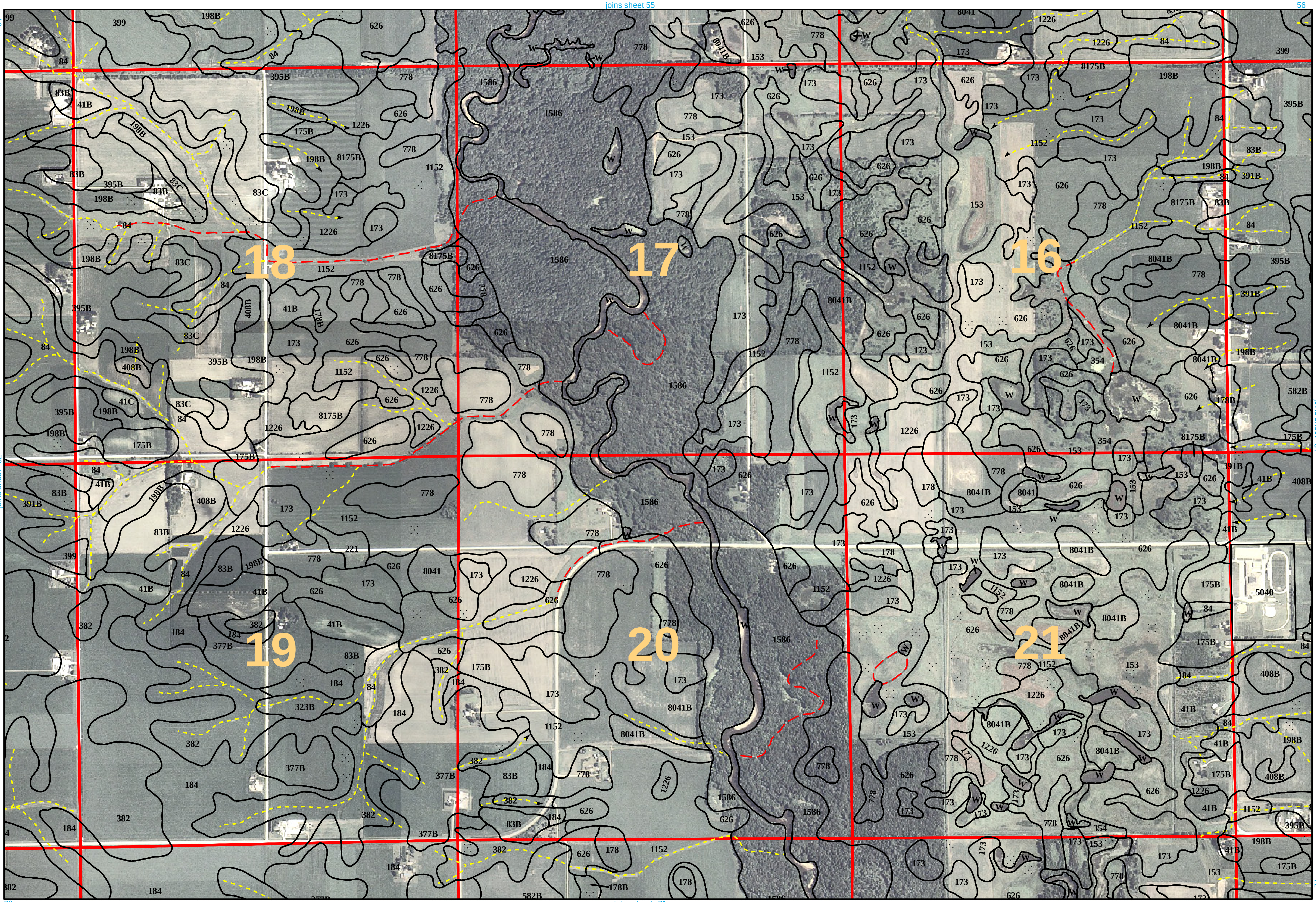

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0 1/4 1/2 3/4 1 Miles

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Township 91N Range 11W

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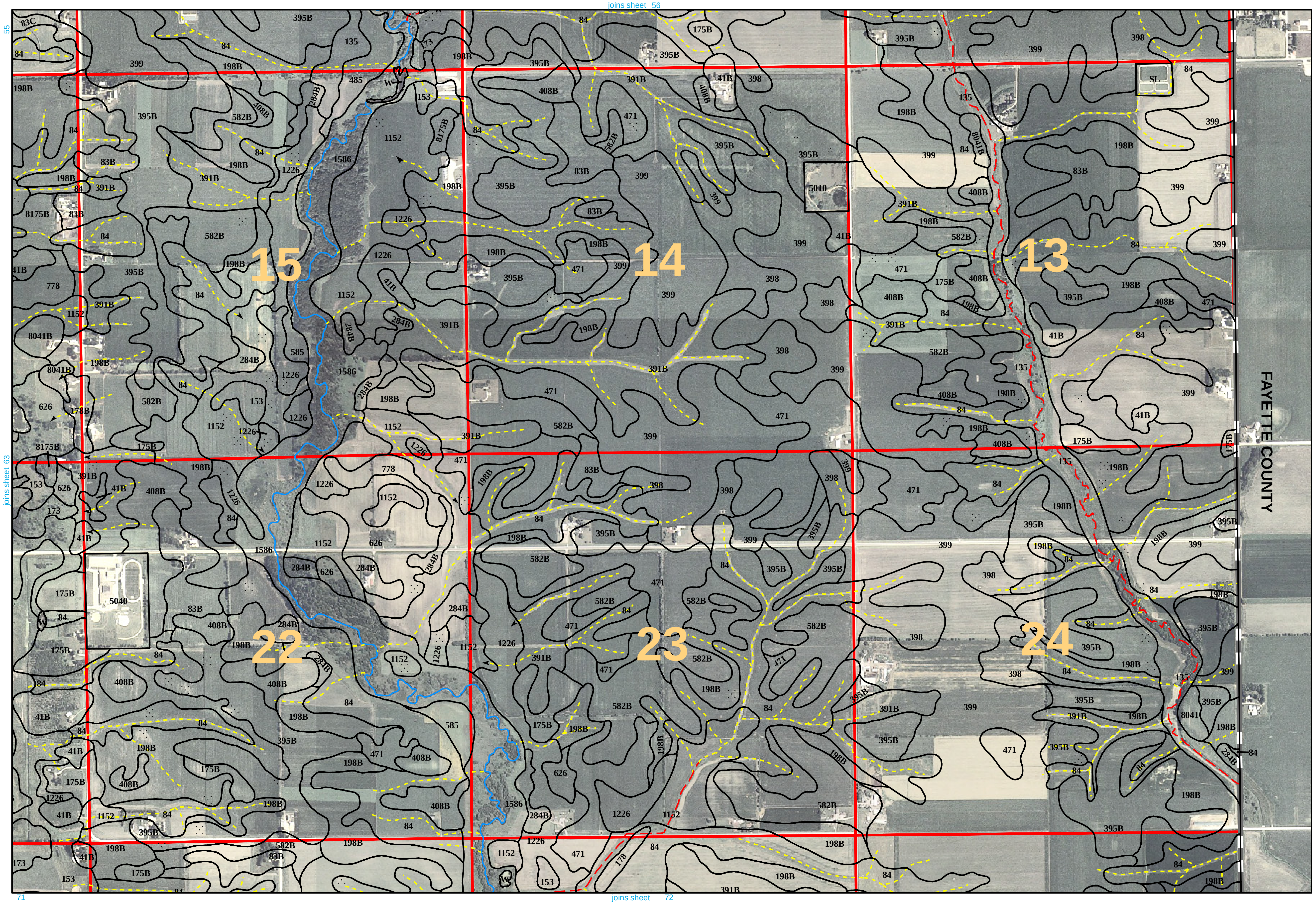

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Township 91N Range 14W

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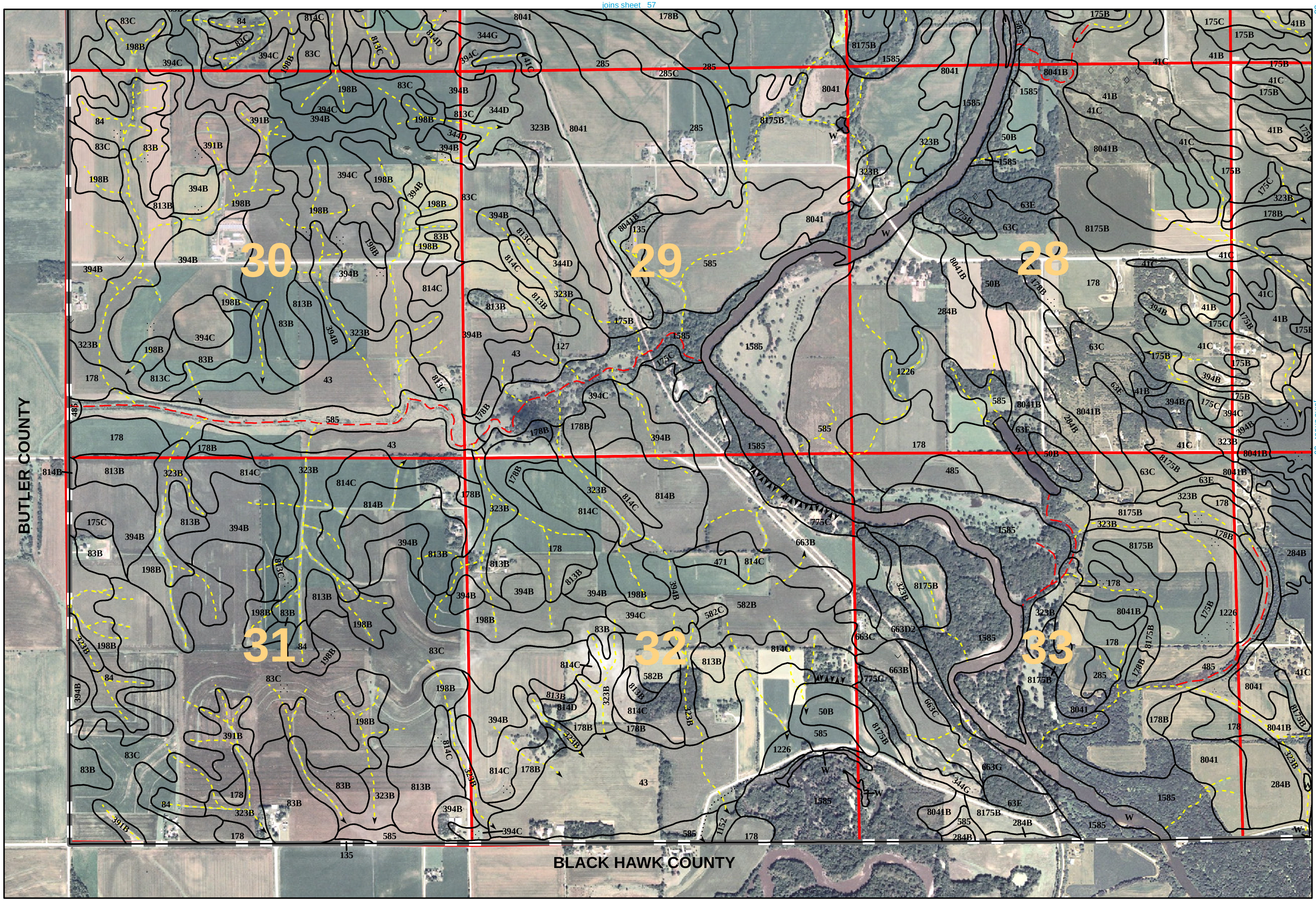

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Township 91N Range 14W

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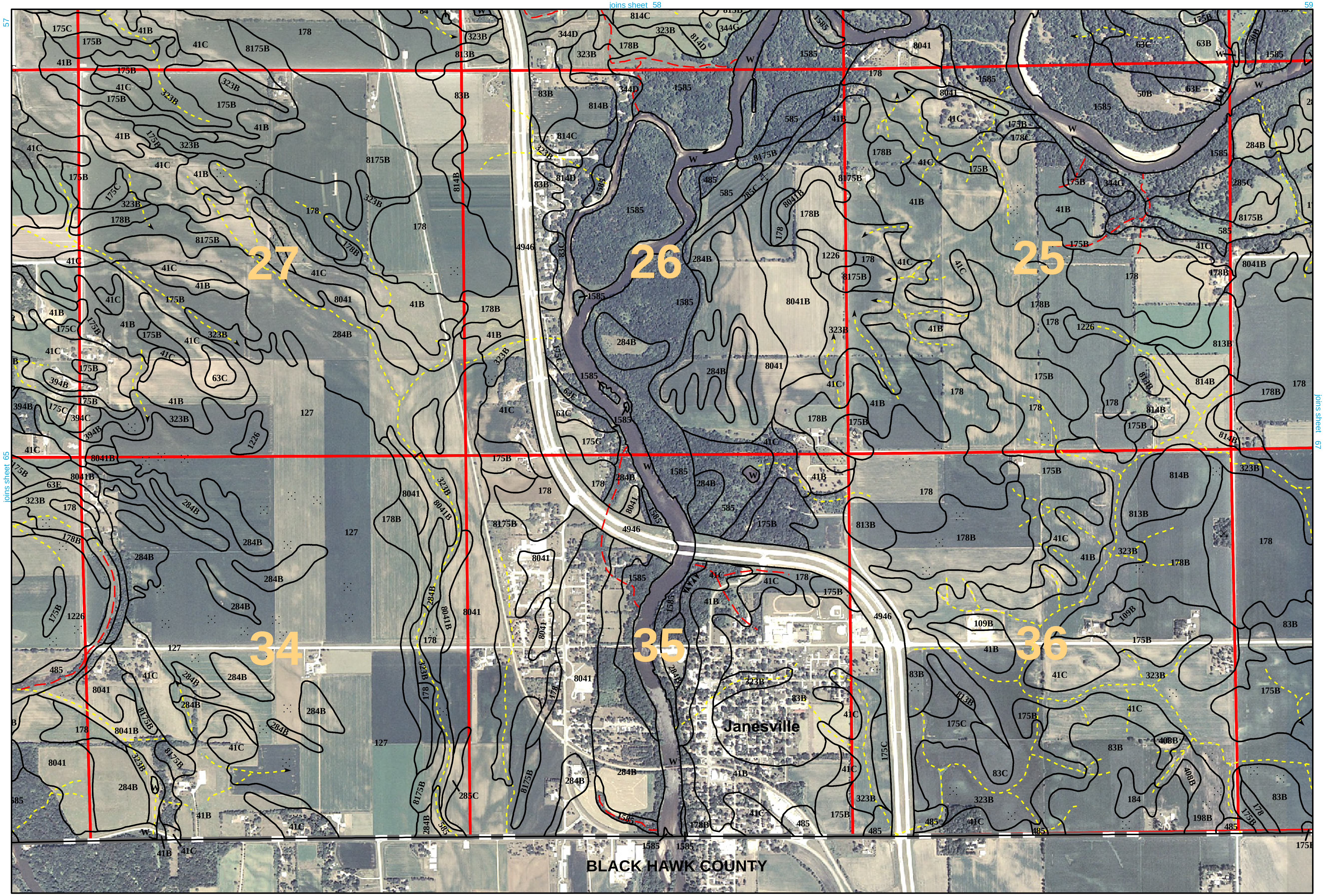

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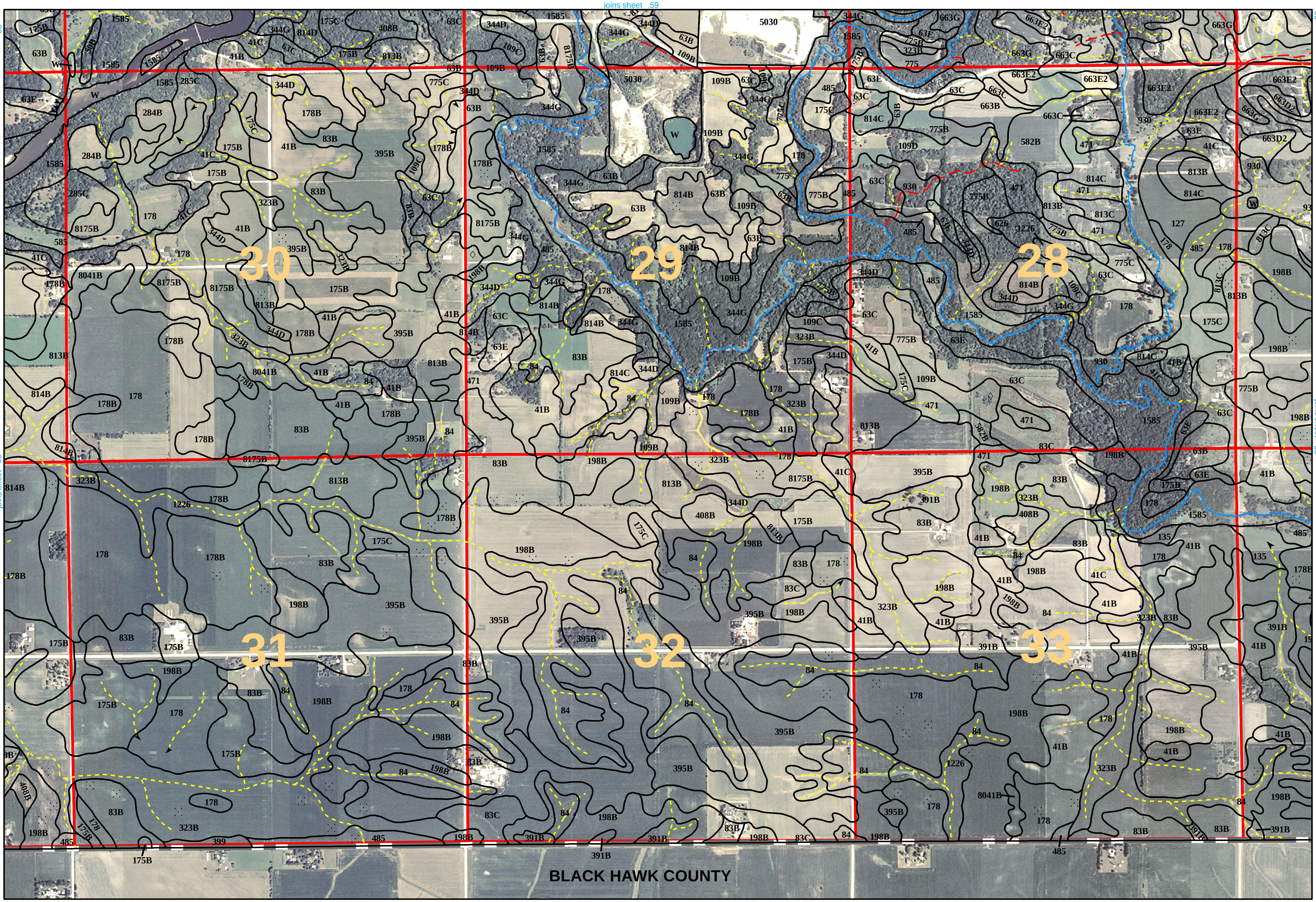

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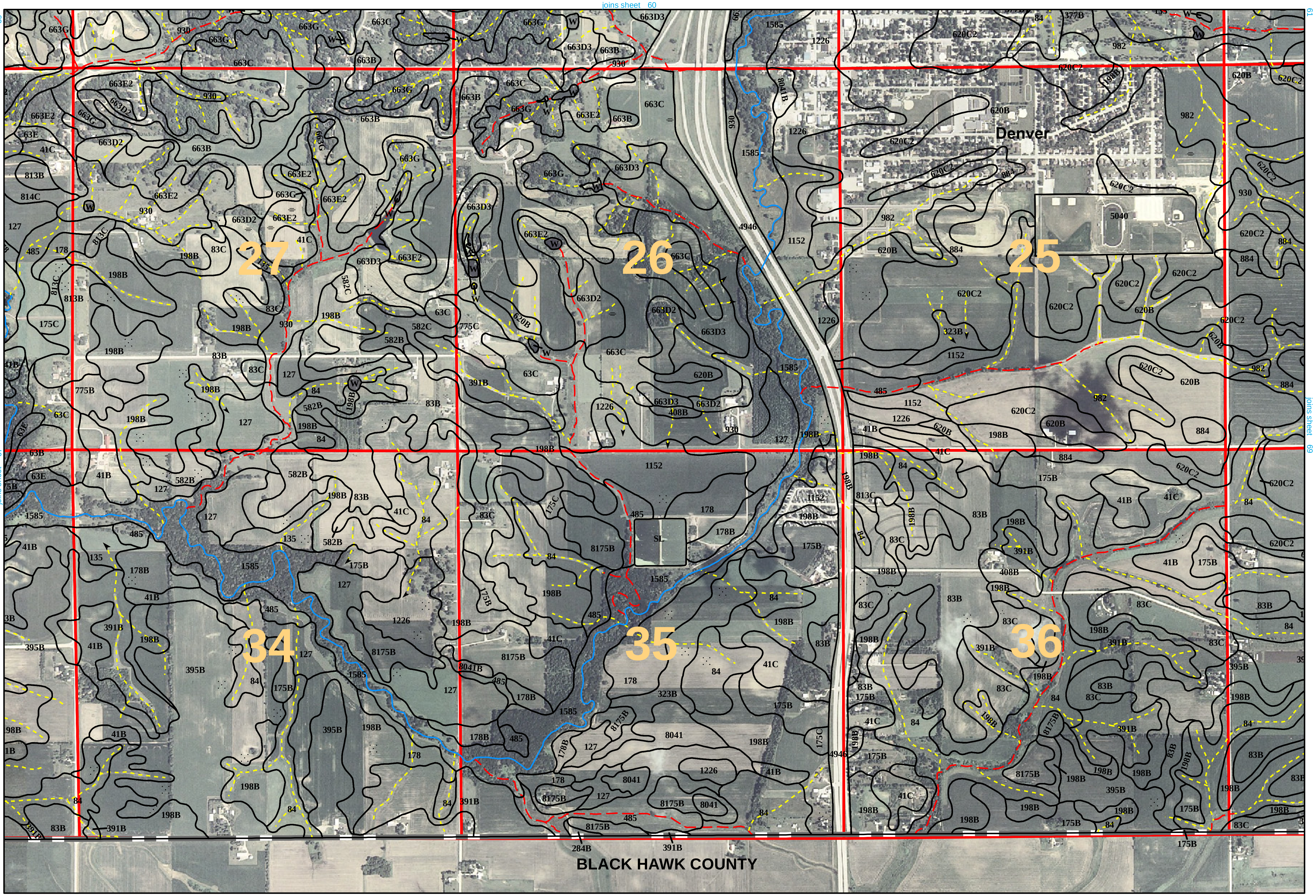
Township 91N Range 13W

68



Soil Survey of Bremer County, Iowa

This map was prepared by the U.S. Department of Agriculture, Natural Resources Conservation Service using the June 11, 2008 Bremer County, Iowa SSURGO certified database. The soils and hydrography were compiled to spring 2002 imagery of the National Digital Orthophotography Program (NDOP) and being displayed on summer 2007 imagery of the National Agricultural Inventory Project (NAIP).

North American Datum of 1983 (NAD83). GRS-80 Spheroid. Universal Transverse Mercator, zone 15.

Visit the online Web Soil Survey at http://websoilsurvey.nrcs.usda.gov for official and current USDA soil information as viewable maps and tables. Visit the Soil Data Mart at http://soildatamart.usda.gov to download SSURGO certified soil tabular and spatial data.

0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Township 91N Range 12W

Soil Survey of Bremer County, Iowa

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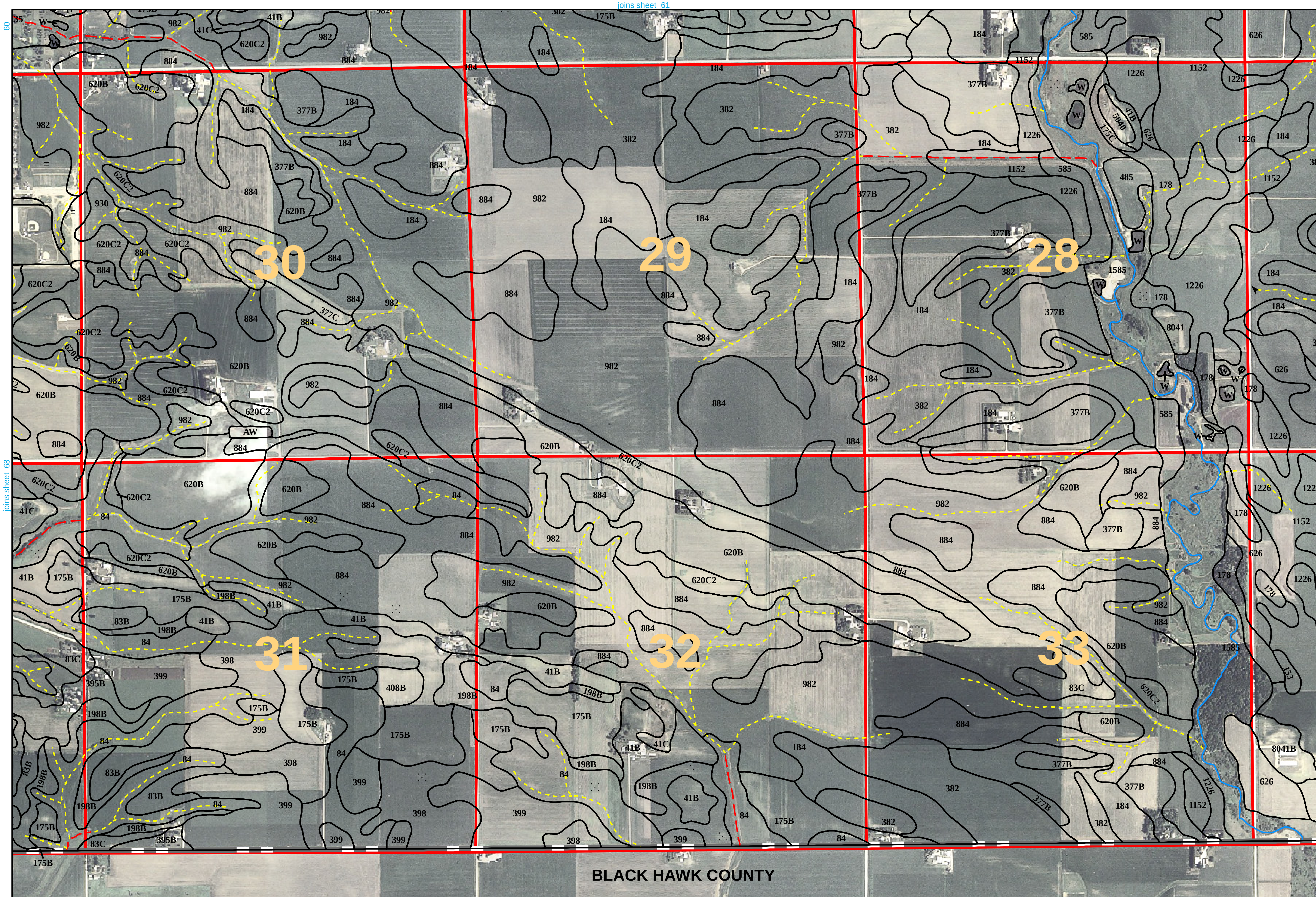

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Township 91N Range 12W

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0 1/4 1/2 3/4 1 Miles

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United States Department of Agriculture
NRCS Natural Resources Conservation Service

Township 91N Range 11W

71

Soil Survey of Bremer County, Iowa

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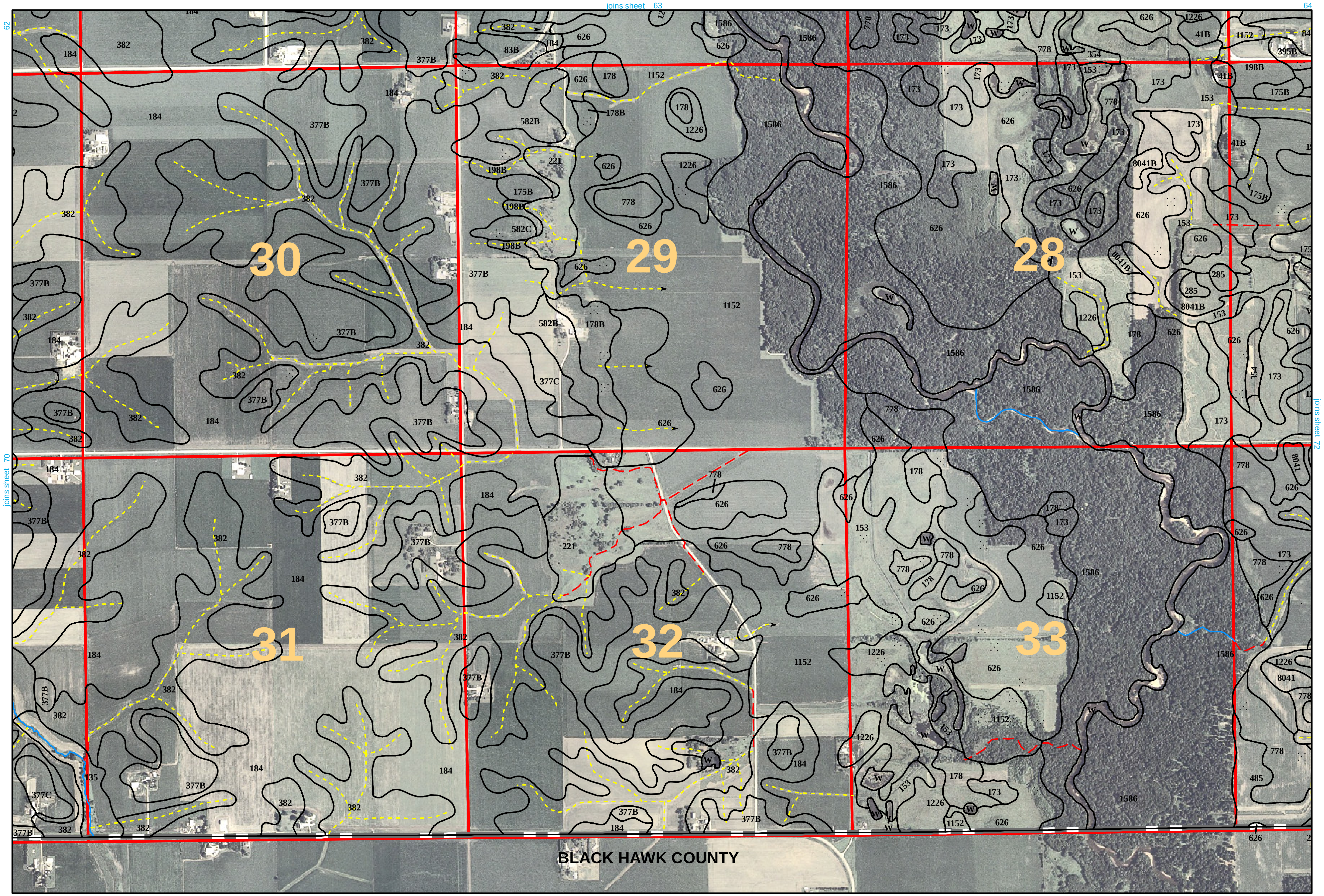

0 1/4 1/2 3/4 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

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Township 91N Range 11W

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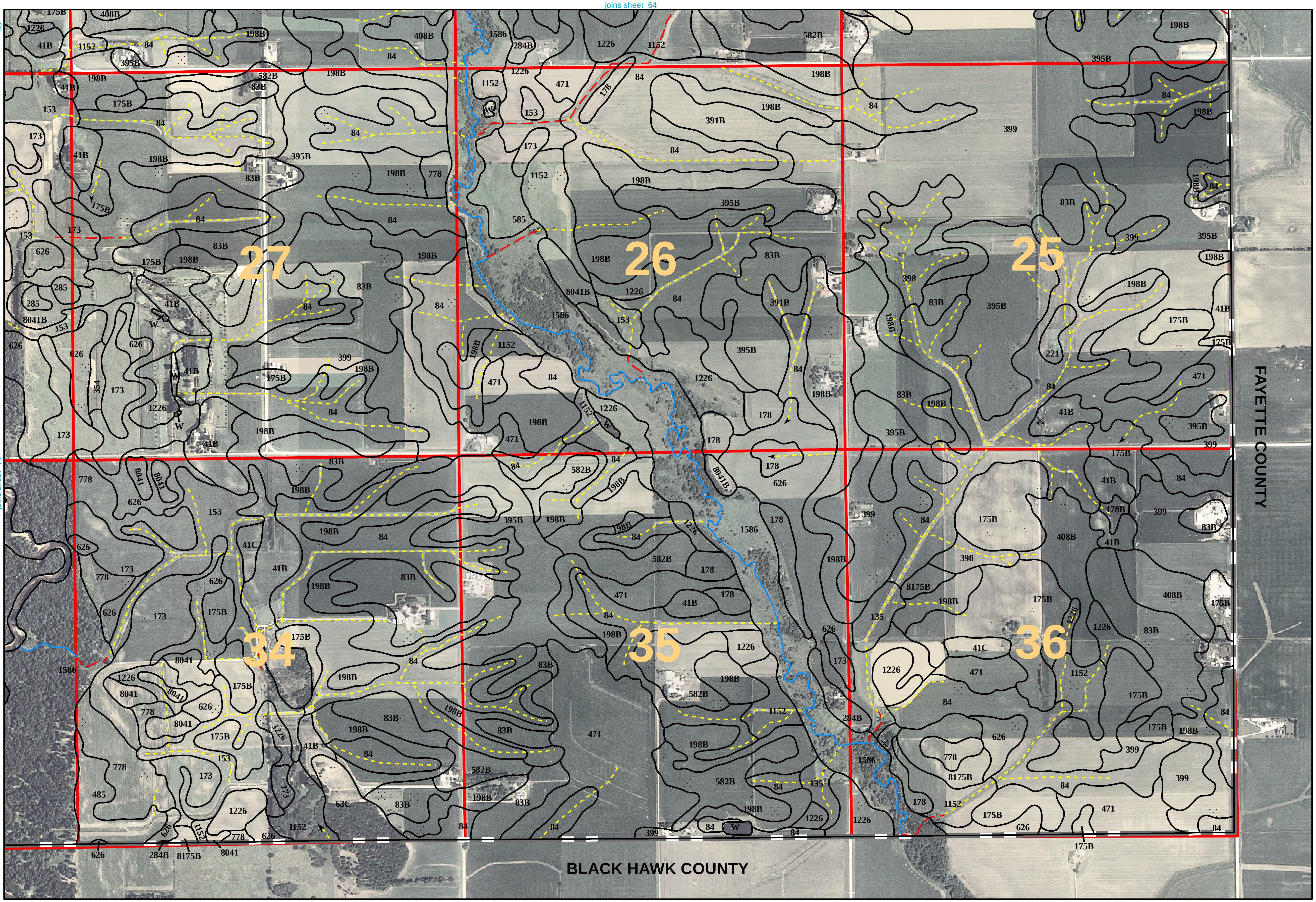

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